the OIL AND GAS JOURNAL
PUBLISHED WEEKLY SEPTEMBER 12, 1960

NEW ERA IN RESERVOIR ENGINEERING?

Intensive core-study project may tell . . .

- How to flood a field
- Where miscible drives will work
- How best to use natural water drive
- How to select the best development pattern

Marketers to tap slow-paying motorists ▸ 63

How three oil men size up Russia ▸ 72

Frac treatments behind Kingfisher success ▸ 93

Automatic pipeline batches automatically ▸ 128

Photogeology speeds up oil search ▸ 162

EXPANDING ORBITS OF SERVICE

Expansion of its services is not new at Halliburton. From its beginning, Halliburton Oil Well Cementing Company expanded through research and development of new ideas that serve the oil and gas industry.

Now we've changed our name to Halliburton Company, to emphasize the *multi-service* scope to which we've grown.

Continue to look to Halliburton Company for *leadership* in cementing, formation fracturing, testing, chemical services, and a wide range of other oil field services.

Halliburton Company's expanding orbits of service will continue to mean the *very best* in quality and performance for its customers . . . worldwide.

Halliburton COMPANY

DUNCAN, OKLAHOMA

OIL AND GAS JOURNAL
Vol. 58, No. 37

Contents September 12, 1960

THE WEEK'S NEWS

General Interest:

Penalty for Overdue Accounts Is Growing Trend in Oil Marketing 63
General Climate for Oil in Washington May Be Improving 64
Big Money at Stake in Mapping of Louisiana Coastline 70
Profits in First-Half Show Slight Improvement Over Last Year 71
Russian Oil Achievement Impressive, U. S. Oil Men Find 72
Texas Oil Industry Fighting Threat of Heavy New Taxes 77
Engineering Job Market Picking Up 77
New Canadian Oil Policy May Be Formulated This Year 78
Industry Briefs 82

Pipelining:

Pipeline Briefs 80
Ten Firms Will Back Chicago-to-Milwaukee Products Line 81
Construction Plans Mapped for Alberta-California Line 84

Processing:

OCDM Studies Exemption of Asphaltic Crude From Import Controls .. 68
Processing Briefs 68
Goodrich-Gulf Ready to License New Synthetic Rubber Process 69
Tidewater, Collier May Build Another Naphthalene Plant 81
Helium Legislation Squeaks Through Short Session of Congress 82

Foreign News:

British Tankers Are Hauling Russian Oil 84
Government-Owned Oil Companies Are on the Increase 85
Two Libyan Stepouts Are Producers 87
Foreign Briefs 88

Drilling-Production:

Atlantic Research Project May Solve Some Reservoir Mysteries 66
Restraint in Development Needed, Humble Economist Says 70
Giant Seeligson Field Unit Is Still Growing 78
Temporary Order Eases Louisiana's Restrictions on Multiple Wells 80
Atlantic Requests "Single Reservoir" Ruling for Record Well 84

Exploration:

Remote Wildcats Test Sparsely Drilled Nebraska Area 159
Aerial Photography Speeds Exploration 162

REGULAR FEATURES

Advertisers' Index ... 193
Book Review 116
Calendar of Events .. 49
Classified Advertising. 189
Deaths 182
Discovery Wells 176
Drilling Contractors.. 156
Drilling Statistics 185
Editorial 59
Equipment Men 152
Exploration Highlights 159
Foreign News 85
Foreman's Page 127
Journally Speaking .. 57
Markets 188
New Equipment 139
Personals 179
Process Costimating .. 136
Production 186
Refining Statistics ... 187
Selected Monthly Data 189
Statistical Summary .. 184
The Journal Said 57
They Say 43
Trade Literature 147
Watching Washington. 65
Who's Who in Oil ... 179

Technology-Operation section on next page →

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TECHNOLOGY—OPERATION

Refining-Processing

Reducing Operating Costs of MEA Gas Treaters 118
Conservative initial design is the first big step in cost reduction. These methods, based on conservative design and with emphasis on trouble-free operation, will serve as a guide in sizing necessary equipment.

New Plastic Packing for Trickling Filters 122
By J. A. Porter and P. H. Dutch
This packing promises consistent removal of 99% of the phenol in waste waters at high loadings, effluent containing less than 0.5 p.p.m. sulfides, and no slime plugging.

The Foreman's Page 127
Refinery chemistry—3: Composition of hydrocarbons.

Process Costimating—79 136
Cost of removing acid gases.

Pipelining

LACT Saves Money in Four Corners 107
By W. J. Fairbanks
Almost all oil produced by Shell in the Four Corners area is being shipped by lease automatic custody transfer. Nine positive-displacement metering units are in service. A savings of more than $100,000 over conventional batteries was realized.

Automatic Pipeline Features Automatic Batching 128
By Marvin Hamilton
Interstate's Liberty and Clinton stations are examples of how a fair degree of automation can be combined with system modernization using older equipment and simple design techniques.

Drilling-Production

Well Stimulation in Kingfisher County, Oklahoma 93
By M. C. Respess
This Mid-Continent hot spot owes its success to modern well-stimulation techniques. In 1960, 12 out of 15 wildcats and 48 out of 49 field wells have been successful.

Kingfisher Wells are Completed With Air 97
By Charles M. Cole
Initial potentials are better with air as a fluid than with conventional mud completion. Dual wells are popular and have been made easier to complete with the development of a new perforating gun.

Split Traveling Block Speeds Up Tubing Jobs 100
By Ed McGhee
New system for well-servicing unit runs singles at the rate of four per minute and pulls three singles per minute.

Fracture Treatments Make Wells Pay Off 104
By Ronald Casey and James C. Shepler
Large-volume sand-oil fracturing method has put the Sacatosa field in South Texas in the black.

Oil-Well Pumping—14 114
By Joseph Zaba
Why sucker rods fail (continued).

Pressure Switches Hold Level in Disposal Tank 120

Flow-Line Connection Helps Add Inhibitor 124

The OIL AND GAS JOURNAL Newsletter

Tulsa, Okla.
September 12, 1960

Depreciation rules may be overhauled next year:

This is industry's best bet for tax relief.

Momentum is gaining in Washington for revisions which would give business and industry more flexibility in determining write-off periods for new plants and equipment.

Watch for strong recommendations to emerge from House ways and means committee.

Another offshore lease sale is being considered. But it probably will not be held before next spring. Interior has had indications of interest in offshore Louisiana tracts. Money from disputed area, meanwhile, is still tied up (p.70).*

Wanted: Workable solutions to residual fuel import control problems.

One of the toughest is how to permit newcomers to enter the program. As it is now, only importers of record in 1957 are eligible.

Another problem is how to gear quotas more realistically to varying company needs. Some firms supplying large amount of resid to domestic users have small import quotas. These firms say they can not afford to buy domestic resid to meet those of contract commitments.

Office of Oil and Gas, long aware of resid program's shortcomings, is giving top priority to a search for solution. Meanwhile, there will be a court hearing September 28 on Gulf Oil Corp. plea for a bigger quota.

▼ ▼ ▼

Some economic trends worth noting:

More and more companies are purging their credit-card lists of inactive accounts.

The reason: Cost of handling the accounts in today's automatic accounting machines. A company with 100,000 cards issued and only 25,000 active, for example, must send the whole 100,000 through machines to credit the 25,000.

---

*Refers to article in this issue giving more details. Where no page is given, the item is a Newsletter exclusive.

Trend toward making service charges on credit-card accounts more than 90 days overdue also is growing. Three more firms have started charging 1.5%. Others are studying similar moves to offset the cost of carrying customers with today's high interest rates (p. 63).

Compact cars and the trend toward more economy even in standard models are affecting petroleum marketing more and more. Marketing executives complain the trend is showing up in slower sales of premium gasoline and in less than expected gains in over-all sales. Same is true of lube and grease sales.

The crude tightness may pose an interesting accounting problem for some refiners.

At least one crude buyer reports many companies will have to cut runs or dip into their Lifo (last-in-first-out) inventory. An extensive use of Lifo stocks would cause them to overstate profits, pay more taxes.

These Lifo stocks are pipeline fills, working stocks, plus in some cases rather large amounts of crude permanently held against some emergency. They first were acquired and entered on the books years ago when crude was cheap. One refiner's inventory averages $1.50 per barrel.

If Lifo stocks are used now at their cheap book value, it will affect refiners two ways: Make cost of crude runs unrealistically low, thus giving an untrue profits picture. And cause them to replace inventory stocks later with $3 oil.

The Lifo stocks are a bookkeeping fiction. The crude has been used years ago but is carried on the books as a constant number of barrels at the average first-in price.

Price of Saskatchewan crude in Parkman and Whitebear fields has been advanced 5 cents by Imperial Oil Limited. Prices now are $2.085 for Parkman and East Parkman crude and $2.015 for Whitebear. Same crude was raised 5 cents last December.

▼ ▼ ▼

Louisiana operators have won a point in their protests against restriction of multiple completions. The state now will permit two allowables on dual completions in new pools. The new order is temporary—lasting only 4 months (p. 80).

The giant Seeligson field unit in South Texas has grown bigger. It has taken in another 4,565 acres of production formerly operated by Humble in the King Ranch area of Kleberg County (p. 78).

Use of malleable aluminum particles to achieve high fracture conductivities in oil and gas wells is reported by Reynolds Metals and Atlantic Refining.

Wells fractured by the pellets—called Frac-Shot—have increased output up to 250% or more. Previous fracturing with sand often resulted in crushing of the propping agent or a sinking of the agent into the formation. Tests show the aluminum particles resist both problems.

▼ ▼ ▼

OCAW plans to start negotiations within a few days with various oil companies for an 18-cent an hour wage increase. The necessary three-fourths of bargaining units in the industry have ratified the wage program and given the union authority to strike if necessary.

Last general wage increase in the industry was 5% in January 1959. The 18-cent an hour goal was determined like this: Cost of living has risen enough to justify a 6-cent increase. Productivity has risen more than enough to justify 12 cents since the last increase.

Production of polyethylene and vinyl resins ran neck-and-neck last year with polyethylene slightly ahead.

Latest reports from the U. S. Tariff Commission show that 1959 production of polyethylene resins was 1.195 billion pounds, a 38% increase. Vinyl output was 1.17 billion pounds, a 34% increase.

These two large volume product groups were followed by styrene resins which totaled 977 million pounds in 1959 compared to 763 million the year before.

▼ ▼ ▼

Australia's Pickanjinnie No. 1 gas discovery near Roma in Queensland looks better.

On recent production tests, the first of four sands flowed 5,712 M.c.f. of gas per day from the 4,007-25-ft. Hospital Hill zone. Flow was through 1-in. choke. Later test of both the first and second sands produced more than 6,000 M.c.f.

Owner of the well is Associated Australian Oilfields.

Other wells now drilling in Australia are Conorada's 1 Oroonoo, 110 miles southwest of Winton in West Central Queensland, and Queensland Standard Gas Co.'s well on Cribb Island north of Brisbane. Three major efforts are slated later.

CFP, the big French company that owns half of Hassi Messaoud oil field, has added two chains of West German service stations in its drive for foreign markets. The stations give the local affiliate, Deutsche Total Treibstoff, a network stretching from the Netherlands to Bavaria.

A wildcat north of Israel's Heletz field has tapped a new oil pool. Negbah 3, drilled 3 miles northeast of Heletz 26, encountered a 2-ft. pay at 4,600 ft. and an 8-ft. pay 90 ft. farther down hole. Tests indicate a 150-bbl. daily producer. The Negbah well is on a closed structure.

Market Memo

Sept. 12, 1960

The hump of seasonal demand passed with Labor Day.

The question being heard most often in marketing circles now is, "What will happen to product prices?"

Product markets are uncomfortably quiet. By industry's own yardstick, light products are in excess supply. Incremental gasoline from high midsummer runs has "come home to roost."

Inter-refinery buying has been timely to date, and as a result gasoline in cargo lots is not pushing the market, despite burdensome inventories.

Refiners are on a tight rope in a period of diminishing gasoline demand, awaiting an uncertain light-fuel demand. Circumstances considered, there can be no valid sales policy without taking into account the realities of oversupply. Management of excess supply will answer the question of product prices.

Gulf Coast prices are steady at posted levels. The 92-RON gasoline is selling at posted price of 11.25 cents with two or three cargoes available for late September lifting. No. 2 is strong at 8.25 cents and closely held, awaiting a certain price advance when weather perks up demand. Bunker C fuel also is tight at $2.35 per barrel.

All is quiet on the Mississippi River with little activity at midriver points. No price changes on gasoline heard with 92-RON being quoted on a spot basis at Gulf Coast low up to one-quarter cent over Gulf Coast low. No. 2 is firm but inactive at 8.50 cents per gallon out of Memphis area.

Chicago gasoline prices, while still subject to some discounting, are considered in pretty good shape at posted levels. No. 1 and No. 2 posted at 10.25 and 9.50 cents respectively, are firm in price with little spot demand.

All products out of Group 3 for northern shipment are firm at posted levels. Gasoline demand continues satisfactory; and discounts off posted prices of 12.50 cents for 91-RON and 15.25 cents for 99-RON are not too prevalent. No. 1 and No. 2 are strong but inactive at posted prices of 10 and 9 cents respectively.

Crude is tight in all areas. Spot crude is avidly sought, difficult to find. Some exchange crude is being offered, but buyers prefer outright purchases.

From TOP to BOTTOM

DERRICKS
DRAW WORKS
ENGINES and MOTORS
SLUSH PUMPS
WIRE LINES
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SWIVELS
TUBULAR GOODS
BITS
WORKING BARRELS
SUCKER RODS
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WHERE YOU WANT IT
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AT REASONABLE
COMPETITIVE PRICES

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LOUISIANA—Shreveport
MISSISSIPPI—Natchez
NEW MEXICO—Farmington, Lovington
OKLAHOMA—Duncan, Oklahoma City, Pauls Valley, Sapulpa, Tulsa
TEXAS—Amarillo, Borger, Colorado City, Dallas, Houston, Midland, Odessa, Pampa

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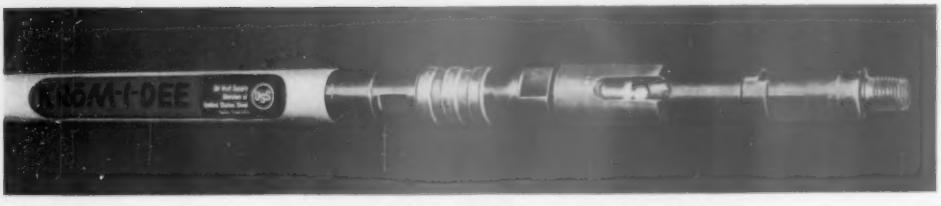
Looking for lower lifting costs? Try one of these "Oilwell" Pumps!

NITRILINE is a new, popular-priced alloy-steel barrel designed for over 80% of today's wells. "Oilwell's" patented Nitrocycle hardening process gives it a hard and uniform inner surface, with an extra tough outer shell. This barrel resists both severe abrasion and mild corrosion.



KROM-I-DEE has an extremely hard inner chrome coating which withstands sweet corrosive fluids in carbon dioxide wells and resists abrasion in very sandy wells. Can also be furnished with chrome inside and out.

HI-BRIN: This extremely hard barrel metal is designed for severely corrosive, sour well fluids. Inside wall is nitrided by patented process after finish honing to assure accurate dimensions and even depth of hardness.

SILVERLINE is for wells which have no serious corrosion or abrasion problem. Honed seamless steel tubing is internally coated with antigalling protective compound which allows plungers to be closely fitted.

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USS

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These one-piece "Oilwell" pump barrels with quality fittings are available in most A.P.I. sizes and lengths at pump shops associated with Oil Well Supply stores. You'll appreciate the cooperative service offered by the experienced subsurface representatives who man these shops.

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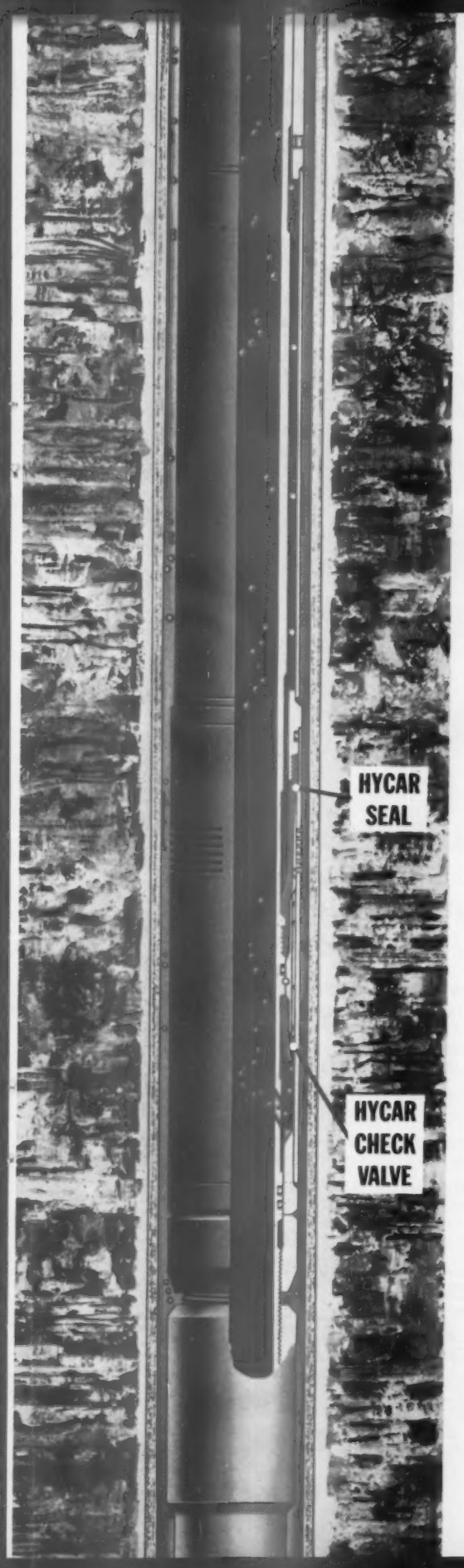

Another new development using

B.F.Goodrich Chemical

raw materials

HYCAR SOLVES GAS PENETRATION PROBLEM

The manufacturer of this gas lift valve wanted a rubber that is dense and capable of withstanding gas penetration. His tests showed that Hycar nitrile rubber provides the answer. Here's the report:

"Our penetration test consists of supporting a rubber slab with pressure of 800 p.s.i.g. natural gas on one side, the other sealed to atmosphere. The fixture was then submerged in a controlled-temperature oil bath at 250°F for 48 hours. There was no penetration. So we continued the test for another 48 hours. This is the only resilient material we have found that has shown no signs of penetration in this test. As a result of these tests conducted in 1959, the manufacturer has standardized on Hycar nitrile rubber in 1960."

In addition, this manufacturer wants properties hard to find in resilient materials—but which are provided by Hycar. They include good shear resistance, elasticity, ability to withstand hot water without shrinkage or hardening, and ability to withstand crude oils with a minimum of swelling and deterioration.

It's no wonder that you find Hycar again and again the choice for handling oil field rubber problems. For more information write Dept. FH-9, B.F.Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

This Type C Otis Gas Lift Valve uses Hycar resilient elements developed by Murray Rubber Company, Houston, for the valve manufacturer, Otis Engineering Company, Dallas. Both Murray and Otis participated in thorough testing of Hycar to test its resistance to gas penetration before selection of material for these parts. B.F.Goodrich Chemical Company supplies the Hycar nitrile rubber.

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GEON vinyls · HYCAR rubber and latex
GOOD-RITE chemicals and plasticizers

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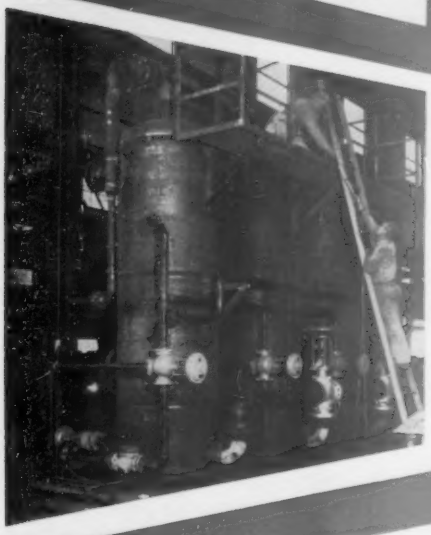

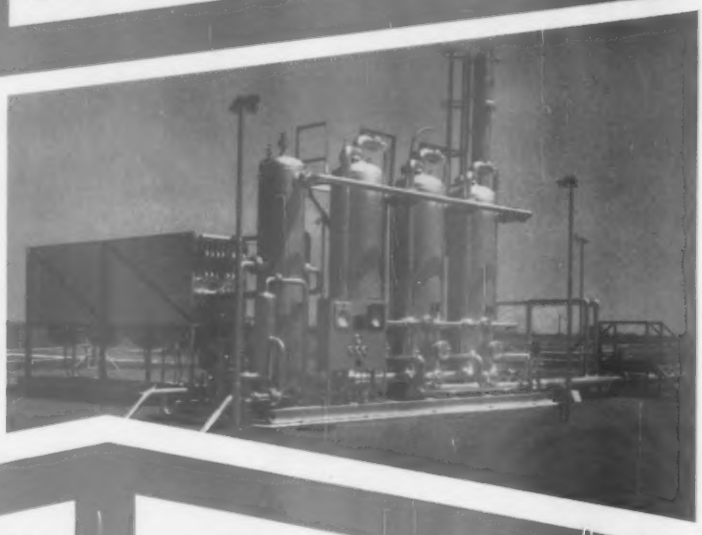

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MANUFACTURING . . . Parkersburg units are backed by rigid systems of quality control.

INSTALLATION . . . Parkersburg equipment installations are supervised by experts.

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. . . and the final proof of quality in sucker rods is how well they perform in the well.

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This is accomplished by attaching rubber thread protectors both to the pin ends and coupling ends of the rods. These protectors are color coded for easy identification of rod types. They afford genuine shock resistance, will not vibrate loose during transit, and are quickly removed without hammering as the rods are made up to go into the well.

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The careful preservation of quality in LIBERTY Rods is reflected in longer, trouble-free performance in the production string. For in all operations, from manufacturing to safe delivery, the goal at LIBERTY is not to produce the most sucker rods in the least time, but to produce the finest sucker rods . . . regardless of time!

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SPECIFY LIBERTY SUCKER RODS AND PUMPING UNITS

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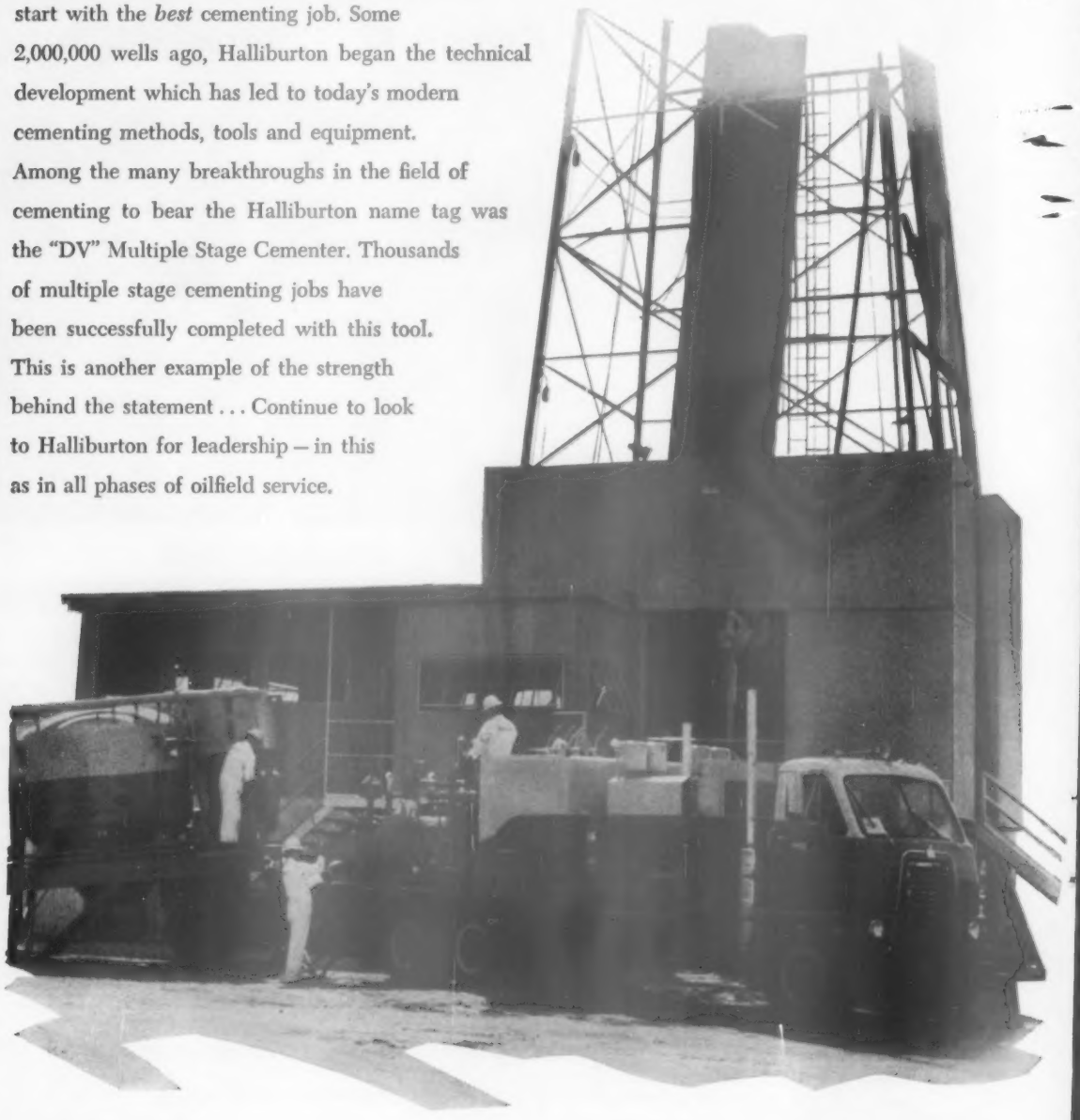
To give your well a good beginning, you should start with the *best* cementing job. Some 2,000,000 wells ago, Halliburton began the technical development which has led to today's modern cementing methods, tools and equipment. Among the many breakthroughs in the field of cementing to bear the Halliburton name tag was the "DV" Multiple Stage Cementer. Thousands of multiple stage cementing jobs have been successfully completed with this tool. This is another example of the strength behind the statement . . . Continue to look to Halliburton for leadership — in this as in all phases of oilfield service.



■ ■ ■ *multiple staging can mean multiple savings*

THE EXTRA SMALL INVESTMENT YOU PLACE IN A MULTIPLE STAGE CEMENTING JOB CAN RETURN BIG DIVIDENDS IN THE FORM OF:

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- More protection against lost circulation by pre-planned straddling of known weak formations!
- Less possibility of cement channeling!
- Lower pump pressures are required!

HALLIBURTON PRODUCTS — *Ideas that work!*

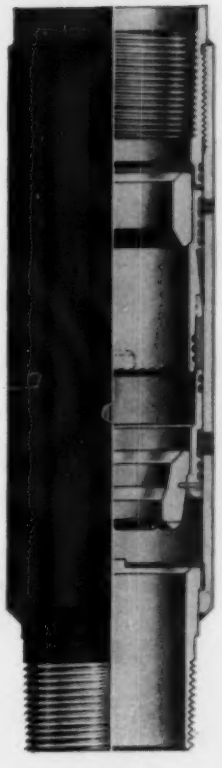
"DV" MULTIPLE STAGE CEMENTER is the key to the job's success. It is designed to open and/or close "on command" from the cementing crew through carefully timed placement of opening and closing plugs. This tool is designed to route the cement to the desired location behind the casing, depending on the stage being placed. Use of two or more "DV" Cementers provides effective *three* stage cementing for the record-breaking depths being reached in today's drilling.

DISPLACEMENT OR BOMB TYPE PLUGS are optional methods to displace cement slurry and operate the opening and closing sleeves in the tool.

CEMENT BASKETS are usually employed in multistage cementing to help support the cement column – as in cementing off above a weak formation.

HALLIBURTON SUPER SEAL FLOATING EQUIPMENT is dependable accessory equipment for use with the "DV" Multiple Stage Cementer.

These are some of the Halliburton tools which make multiple stage cementing not only possible – but *proven practical.* See your Halliburton man for all the details.



"DV" MULTIPLE STAGE CEMENTER

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CEMENTING SERVICES

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All around the world it has been conclusively demonstrated that Magcobar's better-engineered drilling mud products reduce unnecessarily high drilling costs. Wherever you are, a planned Magcobar mud program can mean faster drilling rate with less down time. And at the same time, a cleaner hole, better cuttings, better logging, and better cores can result.

The benefits of a good mud program, a *planned* Magcobar mud program, are reflected in total drilling cost. These benefits can extend even to better and more production without the use of stimulants.

On your next well, reduce hole time, speed up drilling, stabilize the hole, and reduce wear and tear on drilling equipment. You'll be in good company, too, right along with the 92 per cent of the world's oil companies who use Magcobar now. And you'll be helping yourself with the better-engineered mud products of Magcobar.

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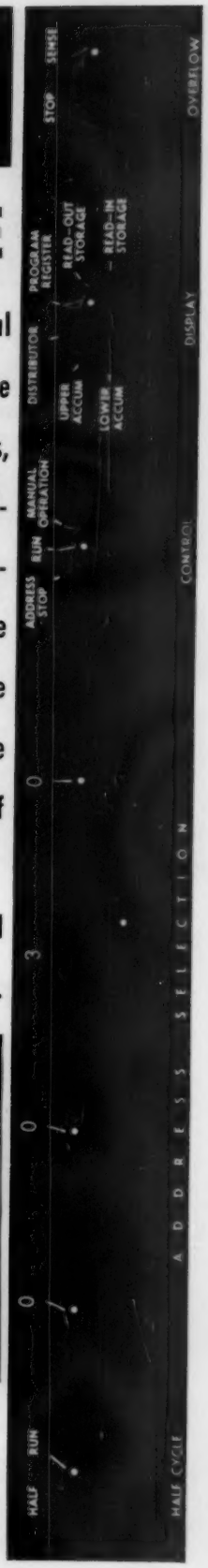
If you're thinking ahead, you'll want to call the nearest TEIA man.



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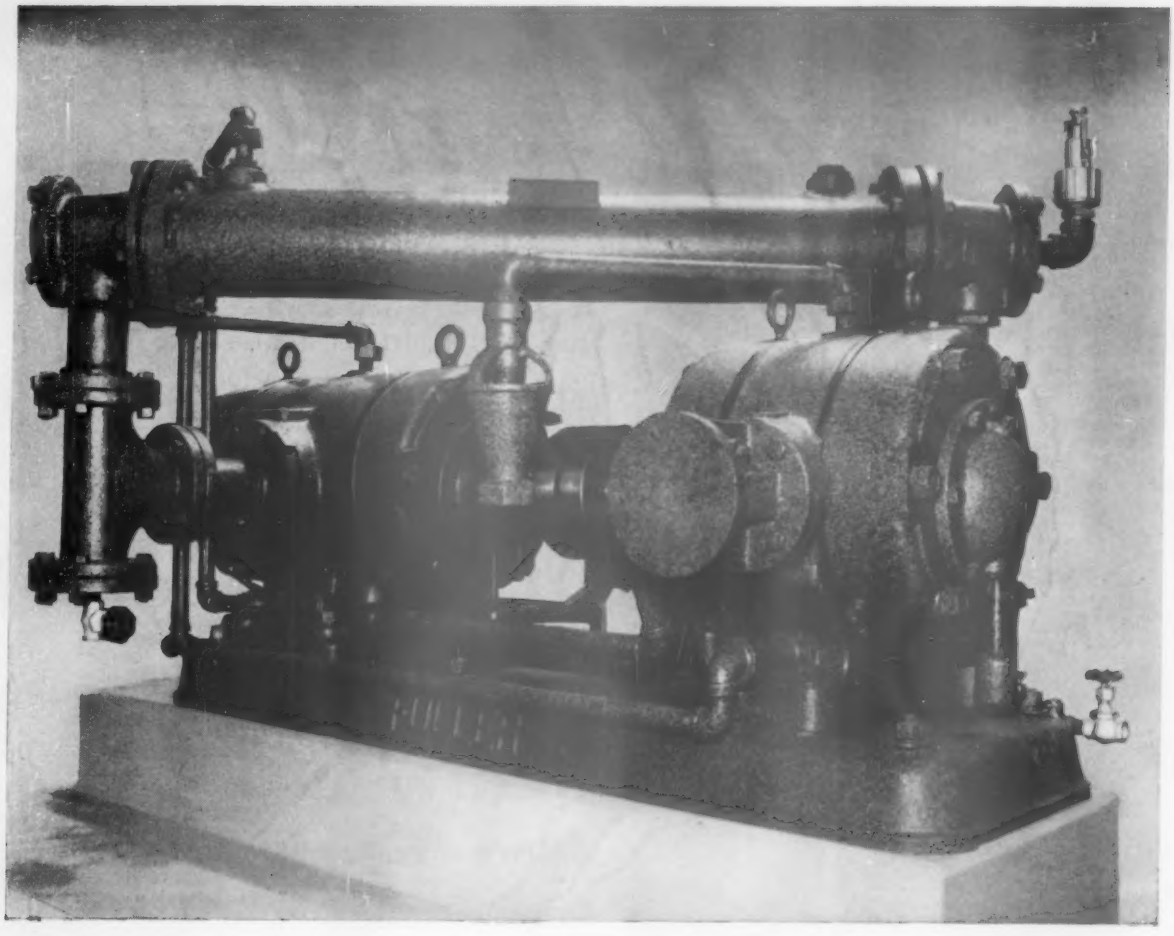


Fuller Compressors With Overhead Intercoolers Offer A New Dimension In Compactness

Fuller Rotary Two-Stage Compressors equipped with Overhead Intercoolers fill the bill where space may be a problem. These compressors produce from 30 to 3300 cfm, pressures to 125 lb. gage and can be readily installed.

These compact Rotary Compressors are vibration-free, thereby eliminating the need for involved and expensive foundations or structural modifications.

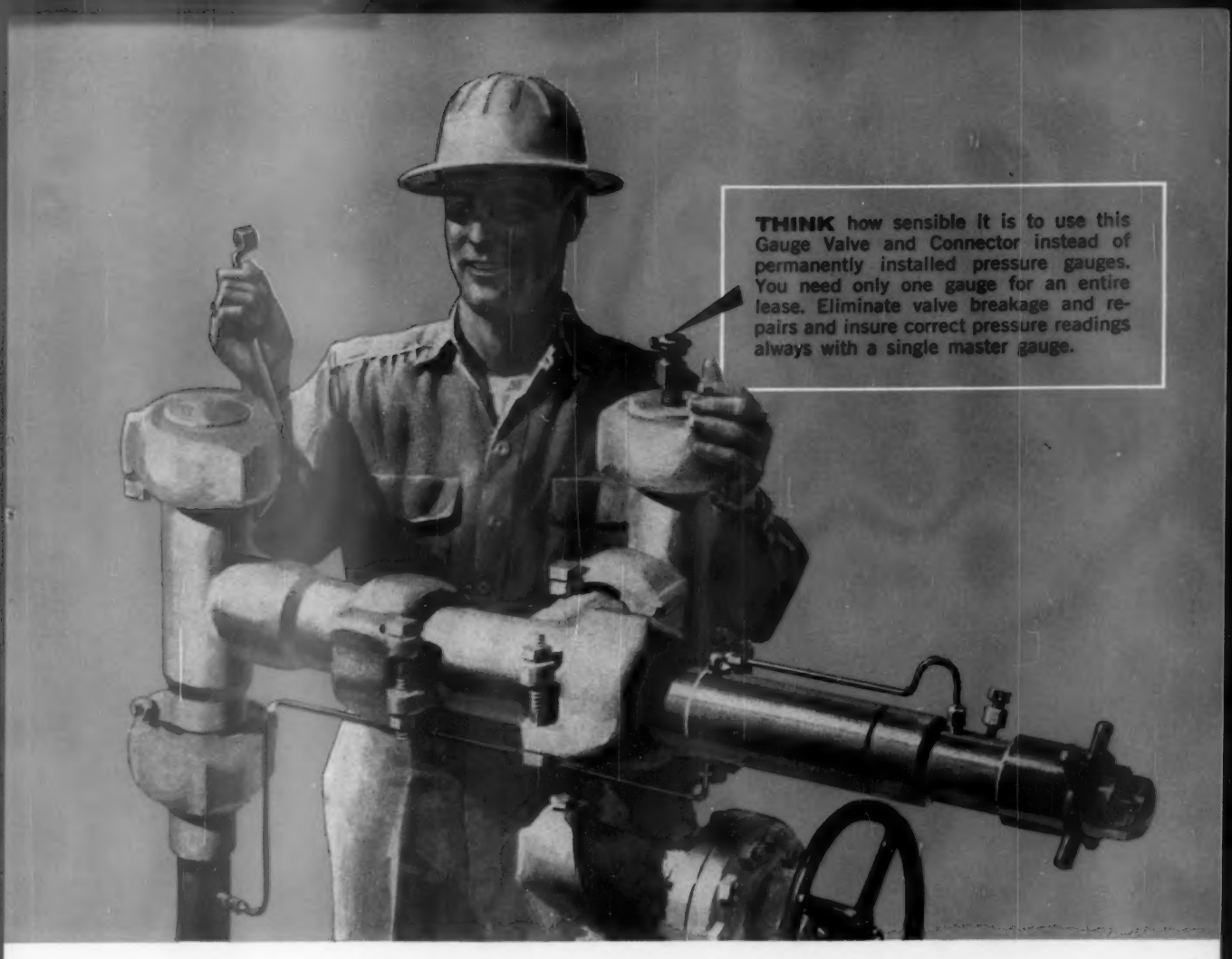
The Fuller rotary principle permits complete freedom of reciprocating parts—valves, crankshafts, pistons—cutting the need for frequent servicing and parts replacement. Minor maintenance is all the care indicated for years of serviceability.

For full details on the maintenance-free economy and high performance of Fuller rotaries, write today for comprehensive, illustrated Bulletin C-5A. 2626 C359

FULLER COMPANY GENERAL AMERICAN TRADE MARK

FULLER COMPANY
132 Bridge St., Catasauqua, Pa.
Subsidiary of General American Transportation Corporation
Offices in Principal Cities Throughout the World

Fuller
. . . pioneers in harnessing AIR


THINK how sensible it is to use this Gauge Valve and Connector instead of permanently installed pressure gauges. You need only one gauge for an entire lease. Eliminate valve breakage and repairs and insure correct pressure readings always with a single master gauge.

UNIBOLT "PRESSUREMATIC"

It's <u>both</u> a high-low safety and a Christmas tree wing valve

Since economy is the order of the day and safety can never be neglected in any economy, the UNIBOLT PRESSUREMATIC VALVE should be of double interest to production men.

Here is a valve that does the work of two valves yet costs little, if any, more than a good high pressure valve.

The UNIBOLT PRESSUREMATIC VALVE combines all of the time-tested and proven features of the Unibolt Adjustable Wing Valve with a novel automatic actuating accessory. The valve closes instantly when a pre-determined pressure balance across the seat is disturbed. The actuating mechanism consists of a small piston which is exposed to well pressure and a larger piston which is exposed to flowline pressure. A broken flowline or open valve, for example, in the production system, would lower the flowline pressure and thus instantly close the valve. Once closed, the valve may be easily opened and set manually for automatic operation. The downstream or low pressure line may be tapped at any remote point and thus embrace any desired portion of a gathering and treating system. Offshore and other remotely controlled wells could be shut in automatically in case of fire, ship collision, etc. The unique design lends itself to many such applications.

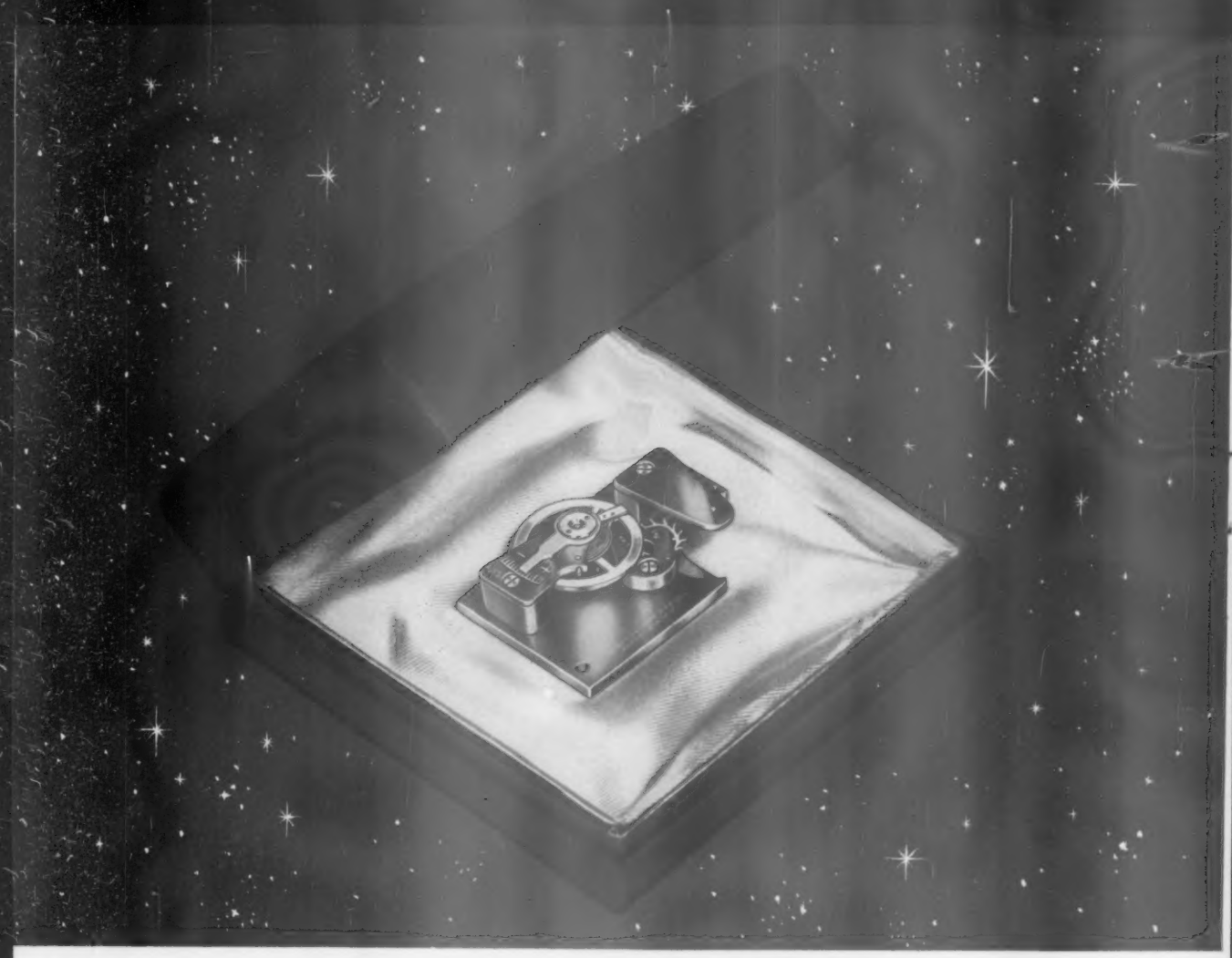
Send for literature or contact your nearest UNIBOLT sales representative.

The regular UNIBOLT Adjustable Wing Valve can be readily converted to "Pressurematic" by replacing the stem/bonnet assembly with the Pressurematic unit.

UNIBOLT

THORNHILL CRAVER CO.

P. O. Box 1184, Houston, Texas



This "jeweled" escapement brings you fine watch quality in chart drives

See how easy it is to convert to seven different rotation rates

The main arbor on the basic chart drive has a rotation rate of seven days. Economical snap on turrets convert this rate to 8 day, 15 day, 16 day, 24 day, 30 day, 31 day and 24 hour rotation. No tools are required and you can even change chart rotation without removing the drive from the instrument.

Now, for the first time you get the extra value of a jeweled movement. This superior construction makes Rockwell chart drives more accurate and sensitive than ordinary chart drives. It requires less power to drive and is extremely durable since there are seven hard jeweled surfaces to overcome friction and wear.

You can use these jeweled movement chart drives *with profit* to power all your recording instruments. They will adapt into practically any instrument case. Speed changing turrets (see left) permit varying rotation rates at will. Write for bulletin. Rockwell Manufacturing Company, Dept. 59J, Pittsburgh 8, Pa. In Canada, Rockwell Manufacturing Company of Canada, Ltd., P.O. Box 420, Guelph, Ontario.

Be sure to register and vote.

JEWELED CHART DRIVES

another fine product by

ROCKWELL

Better products, *faster*, from your Federal-Mogul Distributor:

Federal-Mogul Engine Bearings have what it takes to keep power at peak performance!

Be "quality" sure . . . use only Fm bearings on every oilfield power plant overhaul

Experienced mechanics know it doesn't pay to gamble with downtime or power loss in any way. That's why they insist on top-quality engine bearings for all engine overhauls. Federal-Mogul bearings have earned their stripes in rugged oilfield service, and the resulting favor of mechanics all over the world.

Precision engineering, metallurgical consistency and finest quality control, backed with unequalled availability, are a few of the reasons why Federal-Mogul engine bearings are first choice in the industry.

Your Federal-Mogul Distributor is ready to help you on all replacement needs. Call him!

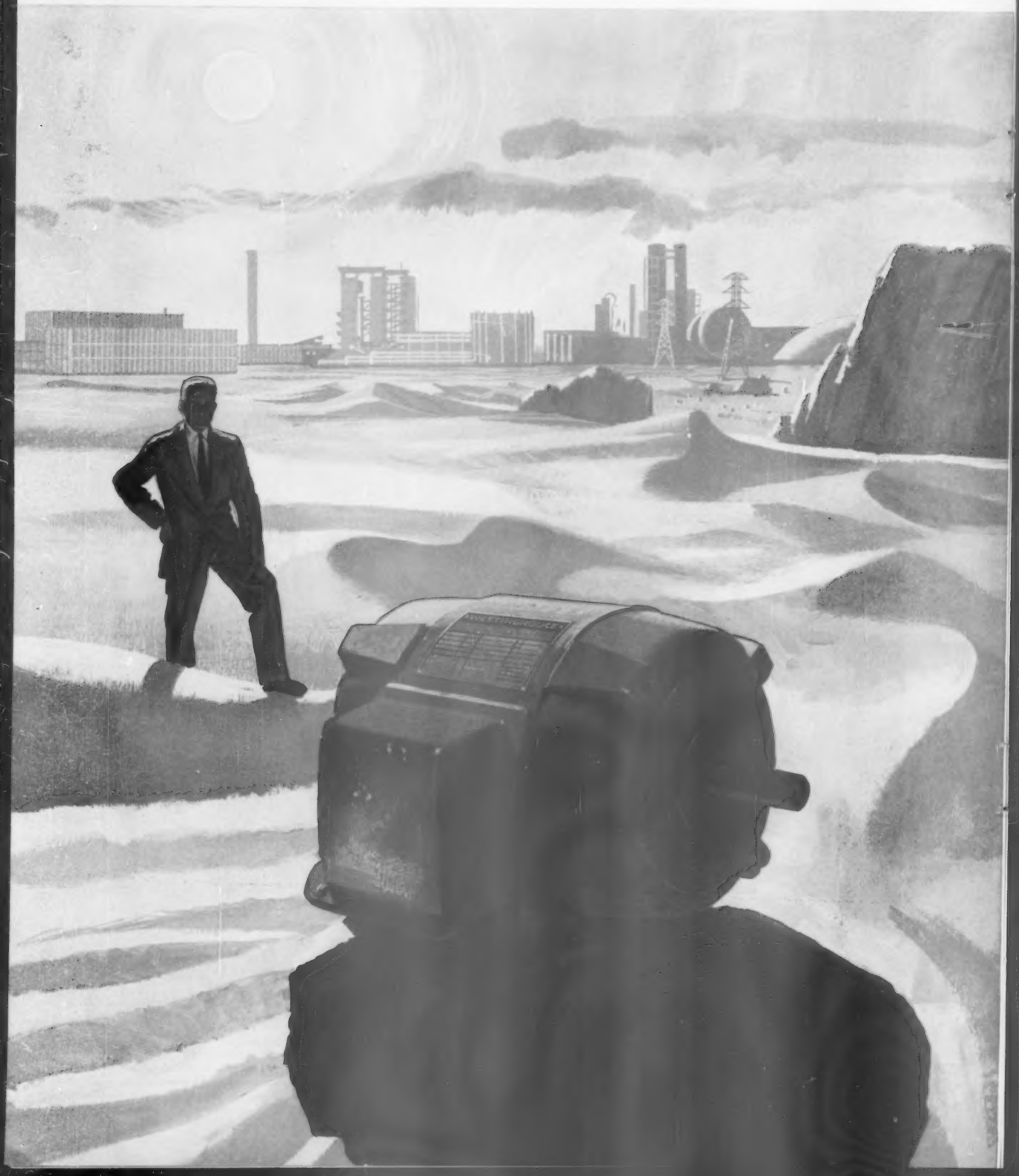
FEDERAL-MOGUL ENGINE BEARINGS

BEARING FEDERAL Mogul SERVICE

FEDERAL-MOGUL SERVICE

DIVISION OF FEDERAL-MOGUL-BOWER BEARINGS, INC. • DETROIT 13, MICHIGAN

NEW WESTINGHOUSE *Guardistor*



MOTORS LET YOU USE ALL THE HORSEPOWER YOU PAY FOR...SAFELY

The man and the motors from Westinghouse now provide absolute protection against motor failure caused by excessive heat . . .

Our Engineering Manager says:
"With the breakthrough development of the Westinghouse Positive Temperature Coefficient thermistors, for the first time we can provide inherent protection against motor failure caused by excessive heat. The solid-state thermistors buried in the windings instantly sense excessive heat from any cause and simultaneously warn of trouble or automatically take the motor off the line. Thus, motor protection is placed where only true motor protection can be . . . in the windings."

Our Marketing Manager says:

- "You can match the motor to the load . . . use all the motor you are paying for.
- Provides positive protection based on winding temperature . . . *not* load current and/or power supply fluctuations.
- Eliminates time and expense of changing winter-summer heaters. No nuisance tripping, it's fail-safe . . ."

Call your Mr. Westinghouse for the application of a Guardistor* motor to your drive requirements . . . write for *Questions and Answers About . . . Guardistor* (B-7876). Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. You can be sure . . . if it's Westinghouse.

*Trade-Mark

J-22160-R

Unlike remotely located sensing devices, PTC thermistors are buried in the windings of the Guardistor motor, instantly equating all temperature factors.

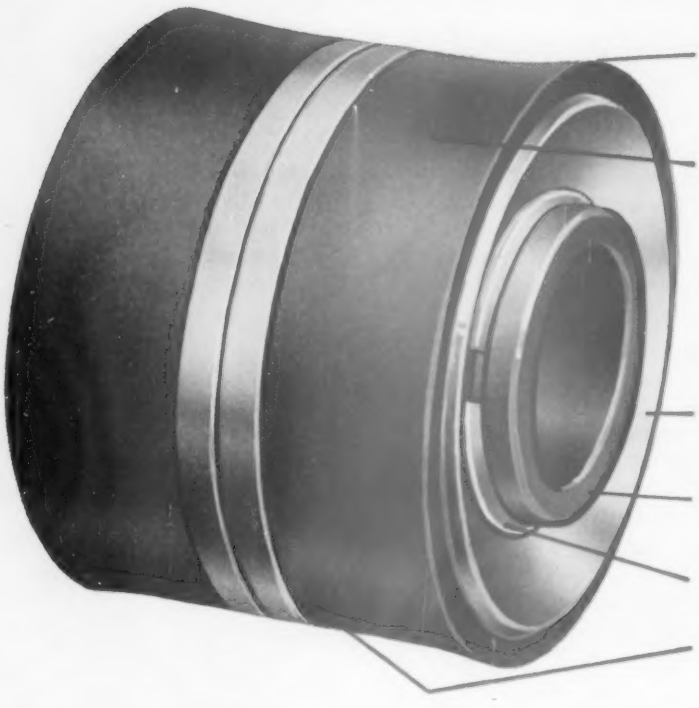
Ever alert PTC thermistors constantly totalize temperature, statically triggering an action *only* if critical temperature is reached.

MOTOR & GEARING DEPARTMENT

Westinghouse

GUIBERSON'S

OIL FIELD TOUGH PUMP PISTON



RUBBER LIP
. . flexible, tear resistant, provides maximum pump efficiency under high or low fluid pressures.

FORMULA-59 RUBBER COMPOUND
. . the secret of a longer pumping life. Developed in Guiberson laboratories, this unique rubber compound is a typical Guiberson solution of a tough oil field problem. Rugged, oil resistant, this rubber is exceptional in its resistance to tearing and for its long life in pumping abrasive drilling muds.

RETAINER PLATE
. . rounded edge, cannot cut rubber, often the cause of premature failures.

HUB
. . precision machined alloy steel forging, fits popular API tapers.

SNAP RING
. . quick and easy to install.

HEAVY FABRIC BACKING
. . greater support for high pressures and heavy muds . . firmly bonded to rubber.

pays off in around-the-clock reliable service

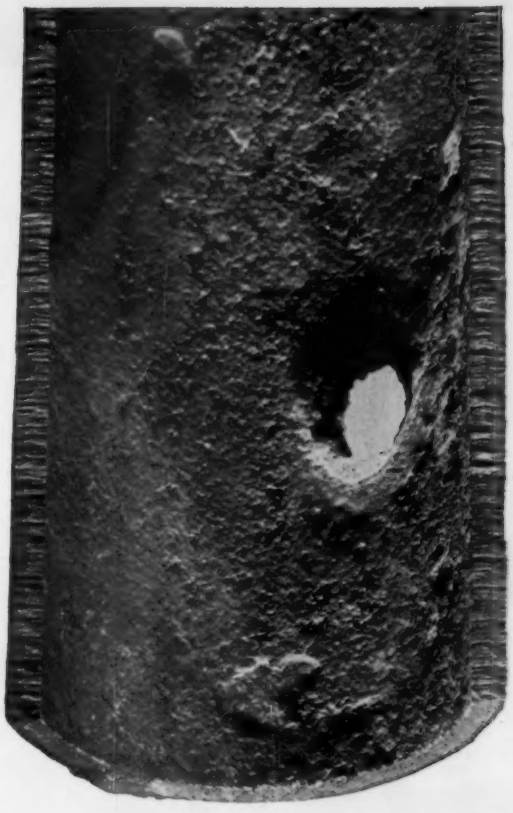
Whether using high pressures or low . . under abrasive or non-abrasive conditions, Guiberson pistons are *record breakers* for longer pumping between rubber changes. Compare them yourself in your own pumps. They are competitively priced, so you gain by longer runs.

Guiberson Pump Pistons
Are Sold by
Oil Field Supply Stores
Everywhere

THE
GUIBERSON
CORPORATION

ESTABLISHED 1919

DALLAS, TEXAS U. S. A.



Sulfate reducing bacteria, cause of corrosion that penetrated this brine line, can now be controlled. New Visco Formulas prevent this attack, in brine, as effectively as in fresh water systems.

In Waterflooding: Strict Control of Sulfate-reducing and Sulfide-producing Bacteria In Brine as well as Fresh Water Systems.

STOPS ➤ **Pitting Corrosion**
Iron Sulfide Sludge Formation

Controlling sulfate-reducing and sulfide-producing bacteria in fresh or brine water injection systems is an integral part of Visco treatment for waterflooding . . . along with efficient clarification, scale prevention and corrosion control.

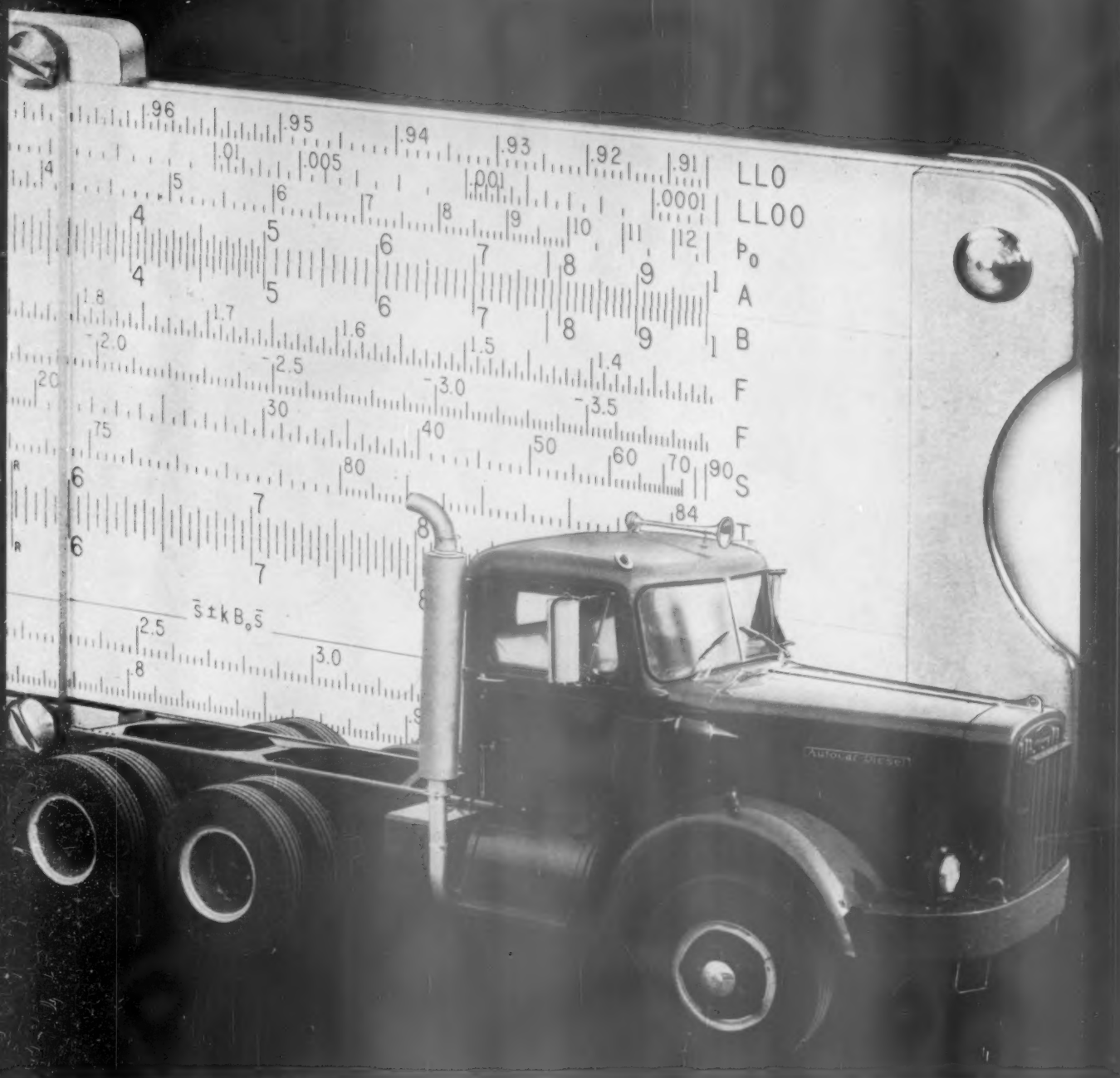
Effective, *economical* control of sulfate-reducing *and sulfide-producing* bacteria in waters of high chloride content is a new development in water treatment practice . . . one you should certainly investigate if control costs are running high—or effectiveness is less than excellent. Write or call for action today.

VISCO PRODUCTS COMPANY
Incorporated
A Unit of Nalco Chemical Company
1020 Holcombe Boulevard **Houston 25, Texas**

Visco

. . . SERVING THE PETROLEUM INDUSTRY THROUGH PRACTICAL APPLIED SCIENCE

Visco CHEMICALS
Visco SERVICES



Only the "World's Finest" is fully custom-engineered to your order

Nothing less than an Autocar can ever give the same owner-satisfaction as an Autocar itself. One reason is that every Autocar is fully custom-engineered and precision-built to do its assigned job with utmost efficiency. Long experience, advanced engineering and flexible manufacture produce just the truck, at a reasonable cost, that will earn the most for you.

The true value of an Autocar lies in the work it will do. In today's truck economics, you can't afford to take less.

Autocar
"World's Finest"

DIVISION OF
THE WHITE MOTOR COMPANY
EXTON, PA.

"I go for one-stop shopping"

Baash-Ross and Web Wilson Tools

are sold only thru supply stores

EXTENSIVE RENTAL AND SERVICE FACILITIES ARE AVAILABLE IN MOST OIL FIELD AREAS . . . CALL US

OUR 41ST YEAR OF PROGRESS

JOY

BAASH-ROSS

DIVISION OF JOY MANUFACTURING CO.

General Offices: Houston, Texas

On every Milwhite desk . . .
We must continually work for Decreased Drilling Costs for our Customers.
MILWHITE
MILWHITE MUD SALES COMPANY
HOUSTON, TEXAS
A DIVISION OF MISSISSIPPI RIVER FUEL CORPORATION

ON SUBMERGED LINES–

Chiksan Swivel Joints flex freely with wave and tidal action

Swift tides and pounding waves make *flexible* offshore lines mandatory. To fill these requirements, producers turn to Chiksan Swivel Joints. Chiksan Joints in submerged service safely handle all maximum operating and surge pressures and provide the right degree of line flexibility to meet any tide and wave conditions. Moreover, Chiksan Joints are designed for salt water service and years of attention-free performance is common. Chiksan Joints and their partner Weco Unions are sold by leading supply stores everywhere.

#59-44

CHIKSAN fmc

A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

CHIKSAN COMPANY—Brea, Calif. • Chicago 5, Ill. • Newark 2, N. J. • Weco (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Co. • Chiksan of Canada Ltd.

Molecular magic makes an old product better, a new product possible when you

mix imagination with Alcoa Aluminas

Industrial magic—the magic of molecular action—has made ALCOA® Aluminas one of today's most rewarding product development materials. Ingredient, agent, reagent, catalyst or catalyst support, alumina in one of its varied types has sparked product and process development in industries ranging from ceramics to cosmetics, chemicals to paper, petroleum to rubber. The reason lies in the unique combination of physical, chemical, thermal and electrical properties which aluminas possess. And years of exploration have shown ALCOA the intriguing ways in which basic alumina molecules may be rearranged to provide crystal structures with the precise balance of properties needed by the individual user. Now it is possible to tailor the many types and grades of alumina to the exact needs of a specific product or process. Our White Data Sheets detail the properties of each grade and type of ALCOA Alumina available to speed your own product development activity. For a copy, write ALUMINUM COMPANY OF AMERICA, 709-J Alcoa Building, Pittsburgh 19, Pa.

ALCOA CHEMICALS

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For finer products . . . let Alcoa add new dimension to your creative thinking!

RUST-OLEUM®

STOPS RUST!®

and matches ORIGINAL EQUIPMENT

COLORS

Distinctive as your own fingerprint. Accept no substitute.

How much does rusty equipment cost *you*? With Rust-Oleum, you STOP RUST—and you match original equipment colors, too, for long-lasting protection!

We want you to see for yourself how *easy* it is to use Rust-Oleum . . . actually take the brush and see how smoothly it works, how it dries to an *attractive, high-gloss finish* that resists sun, fumes, rain, heat, snow, salt air and salt spray, and blowing dust and sand. And the same formula can be applied by brush or spray. Just check the coupon for the color you want . . . and attach it to your business letterhead for a FREE TEST SAMPLE. No cost or obligation.

Your Rust-Oleum Distributor maintains complete stocks for immediate delivery.

ATTACH COUPON TO YOUR BUSINESS LETTERHEAD FOR FREE TEST SAMPLE

CHECK COLOR TO MATCH YOUR EQUIPMENT

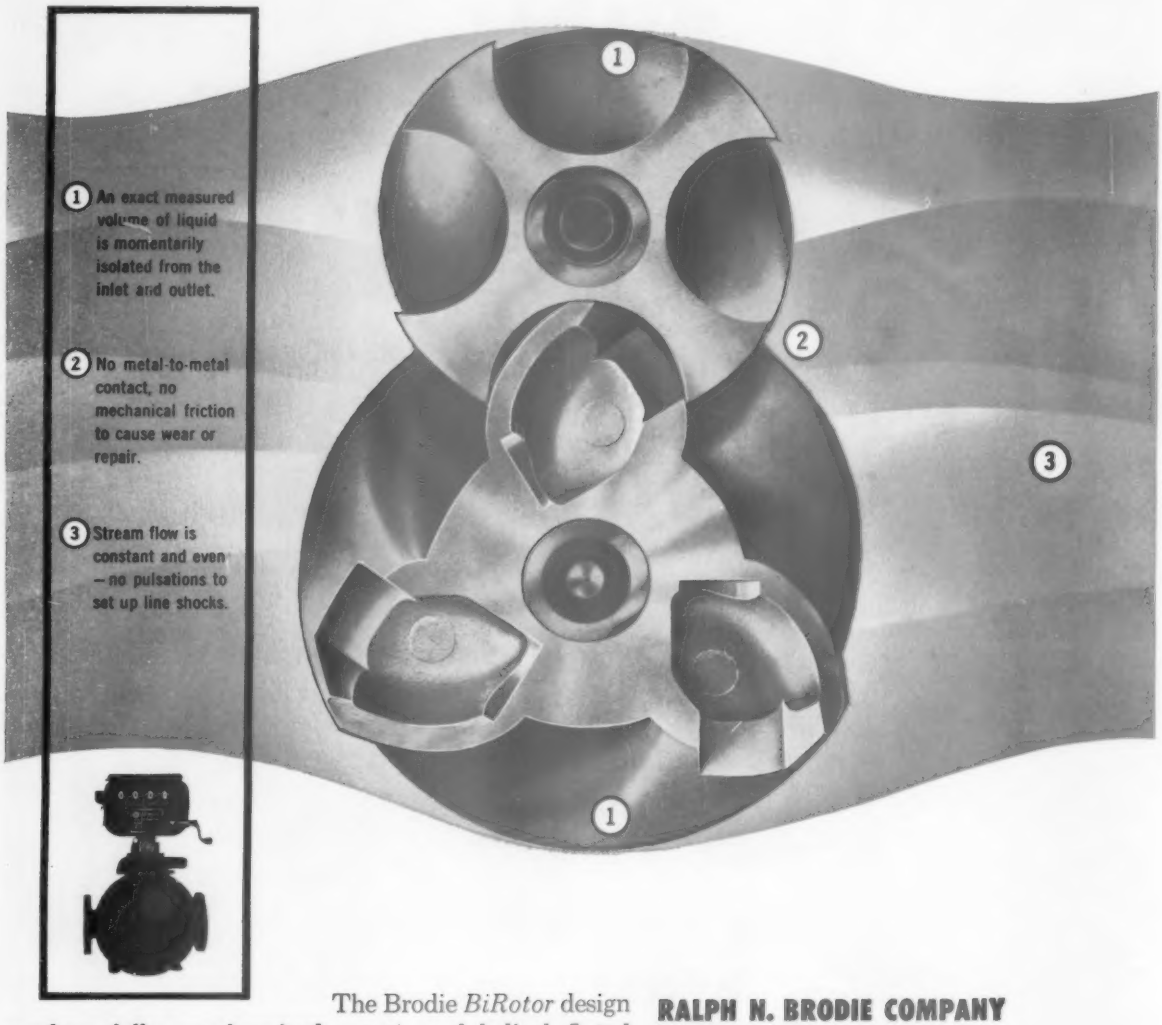
RUST-OLEUM CORPORATION, 2628 Oakton St. Evanston, Ill.
Please send me a FREE TEST SAMPLE in the color checked:

- ☐ 769 Damp-Proof Red Primer
- ☐ 634 Quick Drying Black
- ☐ 2766 High Gloss White
- ☐ 470 Ready Mixed Aluminum
- ☐ H-4 Caterpillar Yellow
- ☐ 722 Bethlehem Yellow
- ☐ 726 New Emsco Green
- ☐ 727 New Unit Rig Gray
- ☐ 724 Waukesha Gray
- ☐ 721 National Blue
- ☐ 723 Oil Well Orange

•*How the Brodie*

TRUE ROTARY PRINCIPLE

...assures full-capacity sustained accuracy


1 An exact measured volume of liquid is momentarily isolated from the inlet and outlet.
2 No metal-to-metal contact, no mechanical friction to cause wear or repair.
3 Stream flow is constant and even – no pulsations to set up line shocks.
1
2
3
1

The Brodie *BiRotor* design employs fully synchronized *rotation* of helical fluted rotors that maintain complete static and dynamic balance under all operating conditions. There are *no* sliding parts, no oscillating pistons to wear – no vibrations, no pulsations in the measuring chamber.

With true rotary action – *BiRotor* action – the liquid moves freely and continuously through the rotors without interrupting line flow. There is no mechanical friction in the measuring unit to cause wear or repair. With this sustained accuracy, there's no need to baby a *BiRotor* – they operate up to full rated capacity.

RALPH N. BRODIE COMPANY
San Leandro, California, U.S.A.
CABLE ADDRESS: "BRODICO"

MT. VERNON, N.Y., 550 So. Columbus Ave.
DALLAS 7, TEXAS, 167 Parkhouse St.
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METERS-VALVES

REPRESENTATIVES WITH STOCKS AND SERVICE FACILITIES IN ALL PRINCIPAL CITIES

Engineering Progress Report
FROM UNION CARBIDE CHEMICALS COMPANY

Glycol Dehydrators give 90°F. Dew Point Depressions...

Improved regeneration systems give high glycol concentrations

There are two methods commonly used today to dehydrate natural gas: one employs glycols; the other, dry desiccants. Most authorities agree that glycol systems are less expensive in both initial and operating costs. Recent engineering advances now permit dew point depressions up to 90°F. with economical glycol-type dehydrators. Union Carbide Chemicals Company maintains an extensive engineering service group designed to help the natural gas industry obtain the best possible dehydration service with CARBIDE's diethylene glycol and triethylene glycol.

A GRADUAL IMPROVEMENT

Diethylene glycol was first used to dehydrate natural gas in 1936 and by 1939 sixteen glycol type plants were in service providing average dew point depressions in the range of 40°F. Triethylene glycol was first used to dehydrate natural gas in 1949. The dew point depressions realized with glycol type plants have gradually increased until today the standard guarantee is a 65°F. depression or gas containing seven pounds of water per MMSCF, whichever first occurs. For sometime now, some equipment manufacturers have offered a 75°F. dew point depression guarantee.

FACTORS INFLUENCING DEW POINT DEPRESSION

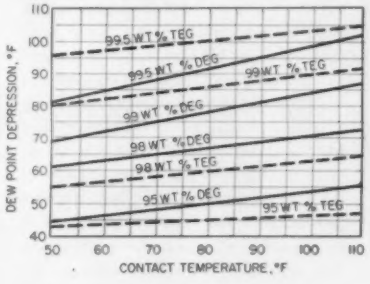
The dew-point depression obtained with a glycol dehydration plant depends upon several factors, such as:

1. Concentration of water in the lean glycol solution.
2. Glycol circulation rate.
3. Contact temperature in the top of the absorber column.
4. Efficiency of gas to glycol contact in the absorber.

Even with conservative design and operation, however, the dew point of the gas leaving the glycol contactor cannot be lower than the equilibrium value for the conditions of temperature and glycol concentration found on the top plate.

HIGH GLYCOL CONCENTRATIONS

The high diethylene and triethylene glycol concentrations now being obtained in plant practice, prompted studies to determine the dew point depressions obtainable with such solutions.



These data indicate that both diethylene and triethylene glycol at 99.5 per cent concentrations provide dew-point depressions in the 80°-105°F. range.

At concentrations of 98 per cent and lower, diethylene glycol provides better depressions than equal concentrations of triethylene glycol, while at 99 and 99.5 per cent concentrations, triethylene glycol appears to allow a 5°-10°F. lower dew point than diethylene glycol.

90°F. DEPRESSION MEETS TRANSMISSION REQUIREMENTS

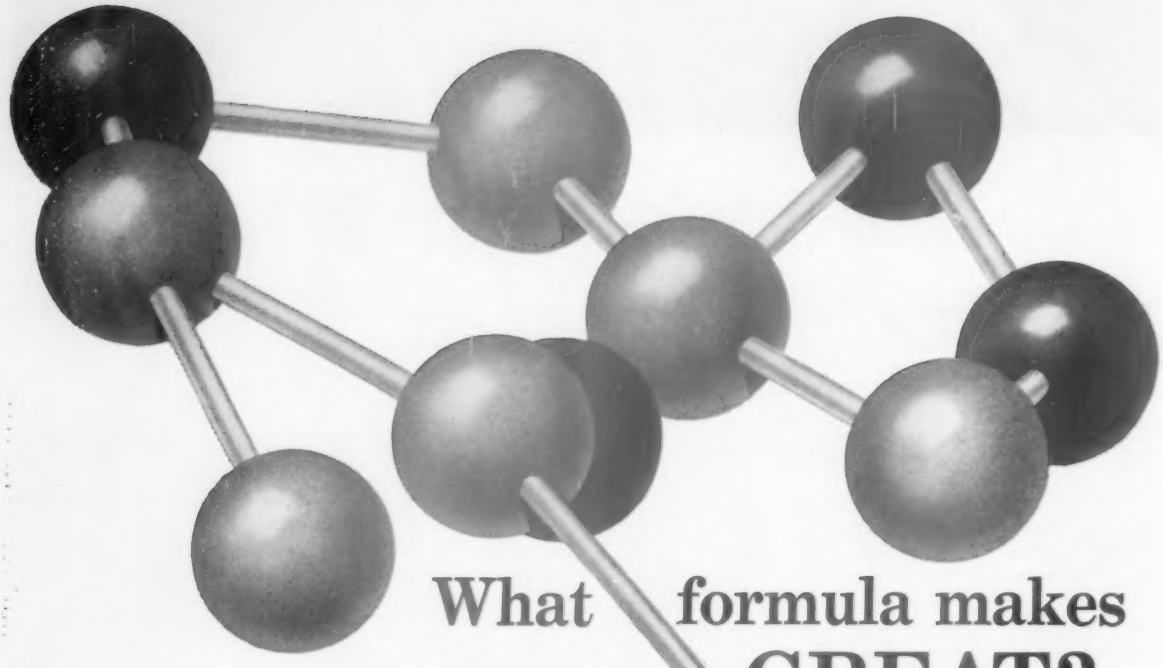
Glycol regeneration equipment on the market today is capable of producing and maintaining glycol concentrations above 99%. Thus, it is possible for equipment manufacturers to guarantee a 90°F. minimum dew point depression. There are very few instances where a 90°F. depression will not meet the water content specifications of any long distance gas transmission company.

CARBIDE'S RESEARCH PROGRAM

Dew point depression studies are but one phase of CARBIDE's extensive research activities designed to improve the products and processes of the natural gas treating industry. CARBIDE's Technical Service Department stands ready to help you obtain the best possible results from your gas treating installations. For more information on the use of CARBIDE's glycols for gas dehydration, call the nearest CARBIDE technical representative or write, Union Carbide Chemicals Company, Division of Union Carbide Corporation, 270 Park Avenue, New York 17, N. Y.

UNION CARBIDE is a registered trade mark of Union Carbide Corporation.

UNION CARBIDE CHEMICALS COMPANY
UNION CARBIDE



What formula makes a company GREAT?

A company like Standard Oil has many chemical formulas, but none of these is *the one single formula* that makes a company great. That formula is people—men who view obstacles as a challenge, who see opportunities where others see problems, who create something of value out of adversity, who give more than a full measure of themselves.

Charles E. Quinn is an outstanding example. Matter of fact, he was making his own living when he was 13 years old. Then in 1925 he joined Standard Oil and soon after attended one of Standard's early training schools for salesmen.

From the beginning, Charles Quinn clicked at Standard. Company training helped him to learn sound business practices. To this, he contributed ingenuity and enthusiastic hard work—a formula for progress that is difficult to beat.

As you might expect, his superiors kept an eye on a young fellow who was doubling, tripling, and quadrupling former sales records. Soon he was made an assistant division manager.

It was a new challenge for Charlie. He had little formal education, but this did not stop him. Through his work at Standard Oil and by studying on his own, he acquired knowledge of law, financing, real estate, labor relations, distribution, marketing—every phase of business. He showed a remarkable grasp of creative management techniques that was to serve him well in years to come.

Today, Charles Quinn, as Manager of the Central Region with headquarters in Chicago, supervises 1700 people and is responsible for a sales volume running into many millions of dollars.

We are proud that Standard attracts and holds so many men of Mr. Quinn's caliber. You'll find them in research, sales, refining, production . . . throughout the company.

Their formula is ingenuity, hard work, customer service and the desire to forge ahead. This is the formula that brings success. It is the reason why you—our customers—get unsurpassed products and service. For Charlie Quinn, and all the others like him, know that well-satisfied customers are the most important element in any formula for greatness. That is why we can say—You expect more from Standard...and you get it!

Charles E. Quinn started at Standard in the sales department 35 years ago. His pride in his company and his desire to give customers better service are typical of Standard employees. They are the secret of his success and ours, too.

STANDARD OIL COMPANY
(INDIANA)

STANDARD

THE SIGN OF PROGRESS...
THROUGH RESEARCH

The customer who thought he got something special

A Gulf Coast oil refiner was in a hurry to build a new catalytic platformer. He needed a special analysis of seamless steel tubing—delivered from the mill in just the exact size and length. But, the refiner was afraid he wouldn't get the steel on time.

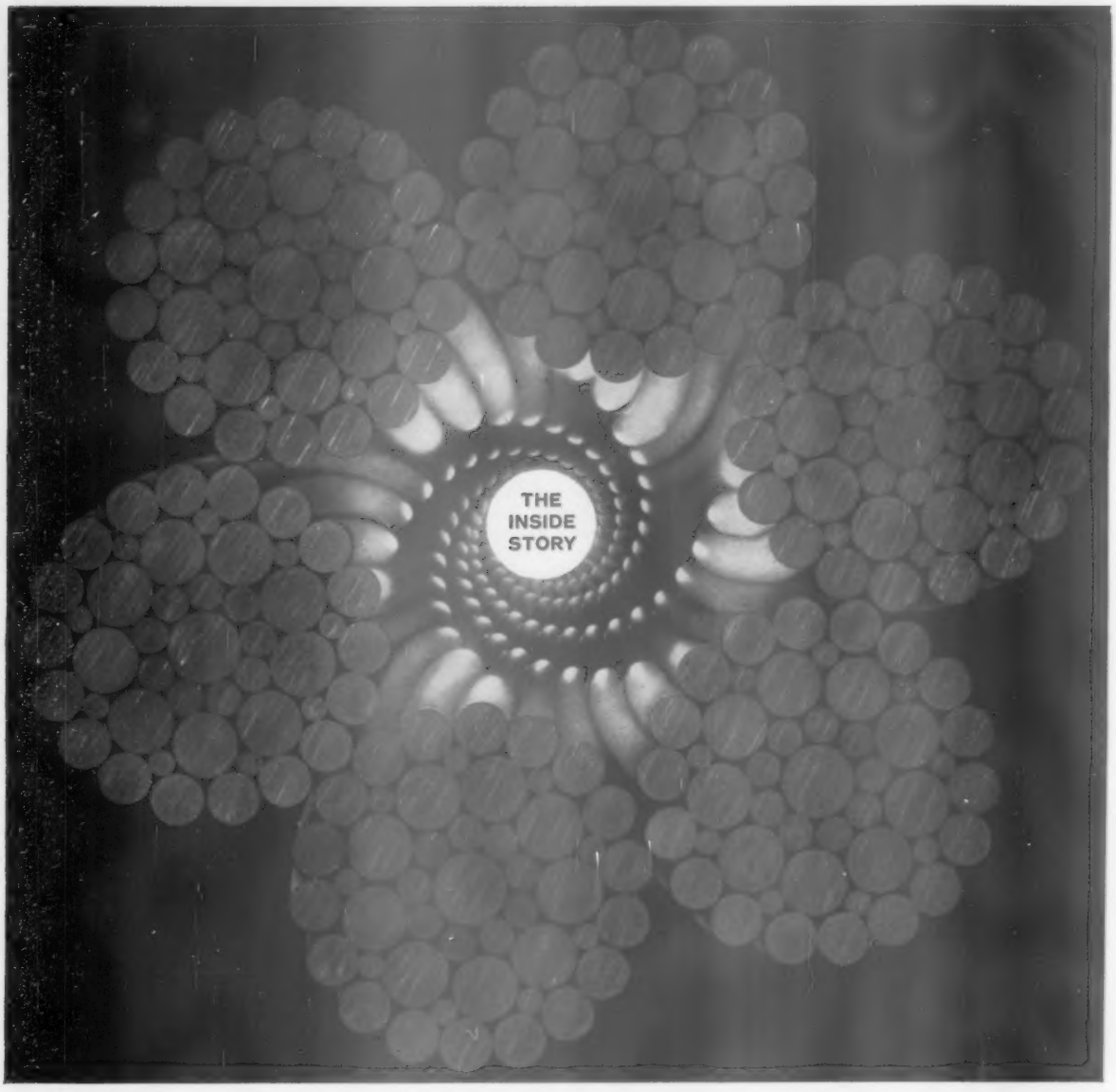
A team of Timken Company experts tackled the problem. They got the steel out on time—so fast that the refiner thought he received special treatment.

And he did—the very same special, individual treatment we're geared to give *every* customer—and do!

This order was routine for our team of metallurgical-production-operating people. Special jobs are right down their alley because they have the know-how and the facilities. You can call ours a tailored operation—but it's really more. The steel was babied all the way. Every modern quality control device kept an eye on the steel all through the melting, rolling, piercing, finishing. It passed every inspection for surface, size and quality and there wasn't a minute's delay. That's the kind of special treatment that's made the Timken Company a leading producer of special quality fine alloy steel.

If you want your steel to receive special treatment, give your next order to the Timken Company, where *every* order is special. And for help in solving your steel problem, consult our metallurgists. They've probably solved a problem similar to yours dozens of times.

The Timken Roller Bearing Company, Steel and Tube Division, Canton 6, Ohio. Cable: "TIMROSCO". *Makers of Tapered Roller Bearings, Fine Alloy Steel and Removable Rock Bits.*



ROYAL BLUE—*we put a lot of work into it—You get a lot of work out of it.*

ROEBLING ROYAL BLUE WIRE ROPE This is rather a long view of a wire rope that's a real work horse. Time and tests have taught us at Roebling that wire rope users *want* the long view. What else, they say, are they spending their money for?

Here, you're looking through a length of Royal Blue whose core has been removed to show the uniformity and symmetry of the rope structure. You see how concerned we are with internal security.

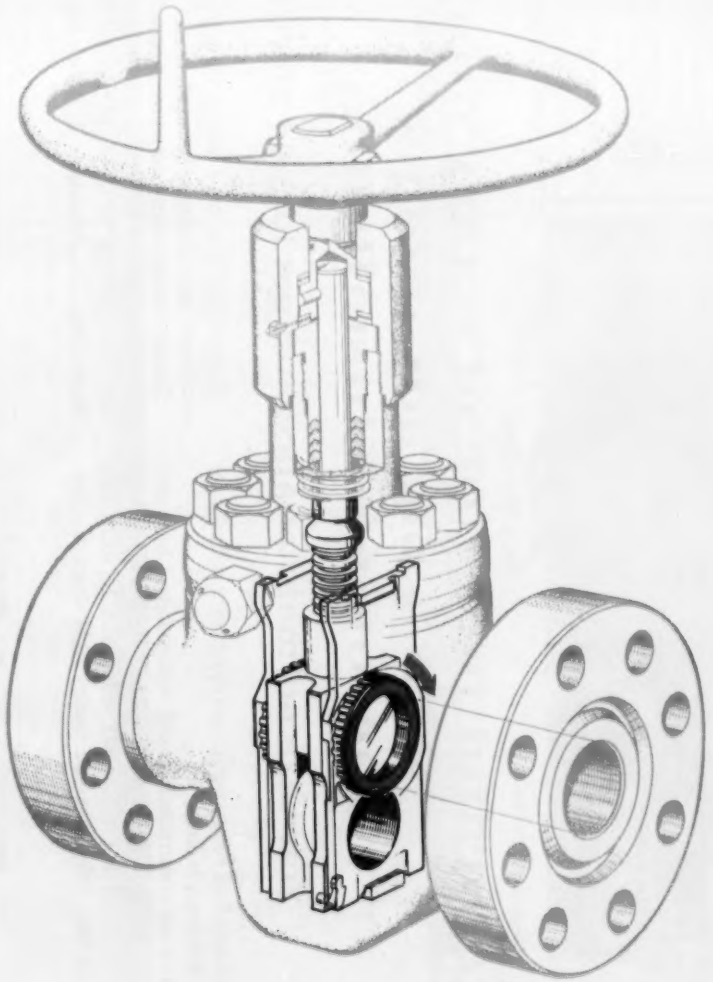
This is one of the reasons why Royal Blue lives up to the day-to-day demands made upon it. High stresses and unavoidable overloads, abrasion, fatigue, impact, crushing, sheave pressures and abusive drum-winding, to name the major ones.

We have to know that the rope we build will do what we sell it to do. Numerous quality-control measures help us—as they do you—to take the long view of Royal Blue. For details about long-lasting Roebling Royal Blue, ask your wire rope distributor or write Roebling's Wire Rope Division, Trenton 2, New Jersey.

ROEBLING

Branch Offices in Principal Cities • John A. Roebling's Sons Division • The Colorado Fuel and Iron Corporation

OPEN-CLOSE-OPEN-CLOSE-OPEN-CLOSE-OPEN-CLOSE-



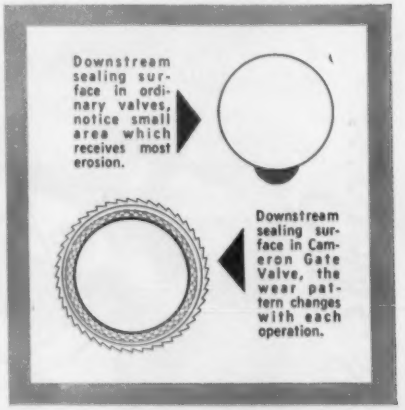
VALVE COST CLUE

The maze of costs connected with the average valve for API service requires more than a clue for a clear understanding, but here is one salient fact applicable to all.

Any API valve serves only one purpose — to open and close the line. The actual cost of the valve is the cost per operating cycle during its useable life multiplied by the number of times it is operated. For a true picture, the average operating cycle cost must include purchase price, all maintenance and repair.

The Cameron Type "F" Gate Valve offers the most operating cycles for the least money — the reason is its exclusive rotating-seat principle, the biggest advancement in API valve design today. With each operation sealing surfaces are changed and wear is spread over the entire contact area. Valve life is extended tremendously.

If you plan, recommend or purchase valve installations for API service you'll want more than a clue to costs — call the nearest Cameron Representative, he can


Downstream sealing surface in ordinary valves, notice small area which receives most erosion.
Downstream sealing surface in Cameron Gate Valve, the wear pattern changes with each operation.

give you complete details on Cameron Type "F" Gate Valves and their "lowest cost operation."

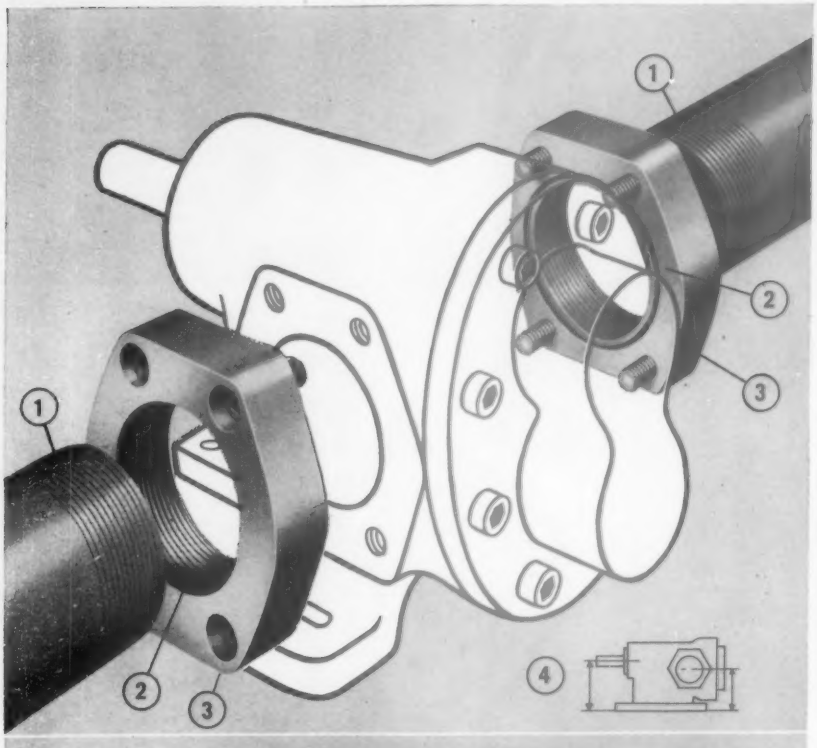
Cameron

IRON WORKS, Inc.

P. O. Box 1212 — Houston, Texas

Export Office: 7912 Empire State Bldg., New York City. In England: Cameron Iron Works Ltd., 76 Grosvenor St., London W. 1, England

Now from Brown & Sharpe...

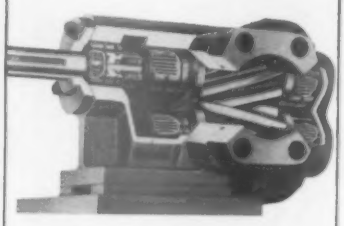


1 Standard threaded pipe connections fit 2", 3" or 4" pipe directly, without extra fittings. Plain pipe flanges optional.

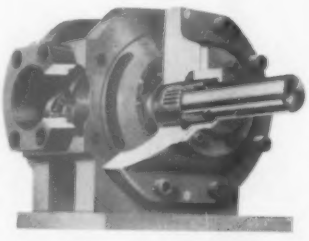
2 Inlet and outlet are same size.

3 Replaceable pipe flanges. Can be quickly changed to eliminate pump replacement caused by damaged threads.

4 Mounting dimensions help assure convenient replacement of other pumps.



New B&S "300" series rotary gear pumps. For pressures to 300 psi; caps. of 40, 60, 90, 125, 175 gpm.



New B&S "700" series gerotor pumps. For pressures to 1000 psi; caps. of 20, 30, 40, 60, 80 gpm. (Note: This highly-efficient design has unusually long service life, because contact between its inner and outer elements progresses at only 1/9 driven speed.)

a brand new line of rotary pumps with 4 big advantages for low-cost installation

You save on maintenance and get longer life, too

These new B&S rotary pumps are designed specifically for the Petroleum Industry.

They are constructed simply, with standard bolts and screws, for easy maintenance. They are equipped with roller bearings and replaceable wear plates, for extra-long service life. They save you money right down the line.

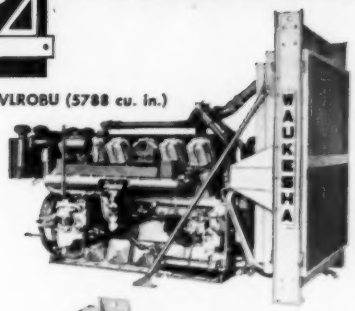
Rugged field tests have proven these pumps every bit as efficient and reliable as intended.

To start saving money on pumps, contact your oil field supply house about new Brown & Sharpe pumps. Ask them for a catalog, or write: Hydraulics Div., Brown & Sharpe Mfg. Co., Providence 1, Rhode Island.

Brown & Sharpe PRECISION CENTER

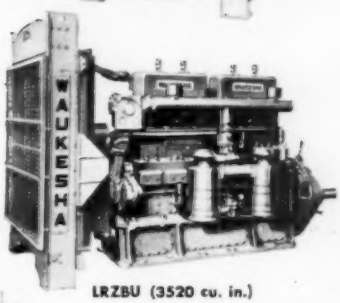
When you need a gas engine... buy a

WAUKESHA "designed for gas" ENGINE



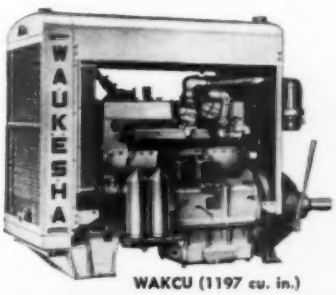
VLROBU (5788 cu. in.)

Need a gas engine? How can you pick a gas engine that's "tailor-made" for your needs? Get a Waukesha *designed-for-gas* engine! Then you can be sure—before you buy. Why? The Waukesha gas engine line is *complete.* You can get *exactly* the right engine to meet your needs. The Waukesha combination of *designed-for-gas—and* built-for-gas construction features, and first-quality materials—with low fuel and lubrication costs—is the result of over fifty years' experience in building fine engines. In oil fields all over the world *Waukesha* is the word and the buy-word for *dependable* full rated horsepower on gas fuel.

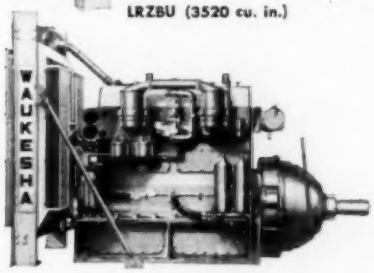


LRZBU (3520 cu. in.)

LOOK at this complete line of WAUKESHA *designed-for-gas* engines. Wide size and power range. Send for literature.



WAKCU (1197 cu. in.)



NKRBU (1905 cu. in.)

496

The ratings below are for standard engines without power consuming accessories

MEDIUM NATURAL GAS ENGINES					800	1000	1200	1400	1600	1800	2000	2200	2400
MODEL	*Features	Bore & S.	Displ.	Torque—rpm	BRAKE HORSEPOWER AT SPEEDS INDICATED								
ICK	4-A	2½x3⅛	61	36-1600	5	6	8	9	11	12	14	15	16
FC	4-Ir	3¼x4	133	88-1200	12	16	20	23	26	28	30	31	31 @ 2600
180-GKB	4-AC	3⅜x3¾	155	112-1400	15	20	25	30	34	37	39	42	43
XAH	4-Ir	3⅜x4½	186	120-1400	16	22	27	32	36	39	42	42	
190-GLB	6-A	3¾x4	265	192-1200	29	36	44	50	57	62	66	67	67
195-GL	6-A	4 x4	302	214-1200	32	40	49	57	63	68	72	75	76
195-GK	6-A	4⅛x4	320	217-1400	32	40	49	58	66	74	80	87	93
135-GZ	6-A	4⅜x5	451	315-1200	48	60	72	83	93	103	112	118	122
140-GZ	6-A†	4⅜x5½	554	395-1000	60	75	90	104	116	127	136	144	149
145-GZ	6-A†	5⅜x6	817	597-800	91	113	135	155	174	191	205	219	230
WAKC	6-A†	6¼x6½	1197	900-800	131	171	204	236	264	283			

LARGE NATURAL GAS ENGINES					600	700	800	900	1000	1100	1200
NKRB	6-AC†	7 x8¼	1905	1505-600	172	197	220	244	266	286	306
LRORB	6-AC†	8½x8½	2894	2270-800	252	300	346	385	420	445	464
LRZB	6-AC†	9⅜x8½	3520	2700-800	305	357	409	450	485	515	537
VLROB	12-AC†	8½x8½	5788	4590-600	524	601	672	743	807	859	890

***FEATURES:** 4, 6, 12—No. Cylinders; **A**—Aluminum Pistons; **C**—Counterbalanced; **Ir**—Cast Iron Pistons. †Special high compression ratios for higher horsepower and better economy are available for use with dry methane type gas with high heat value of 1150 BTU/cu. ft. or less.

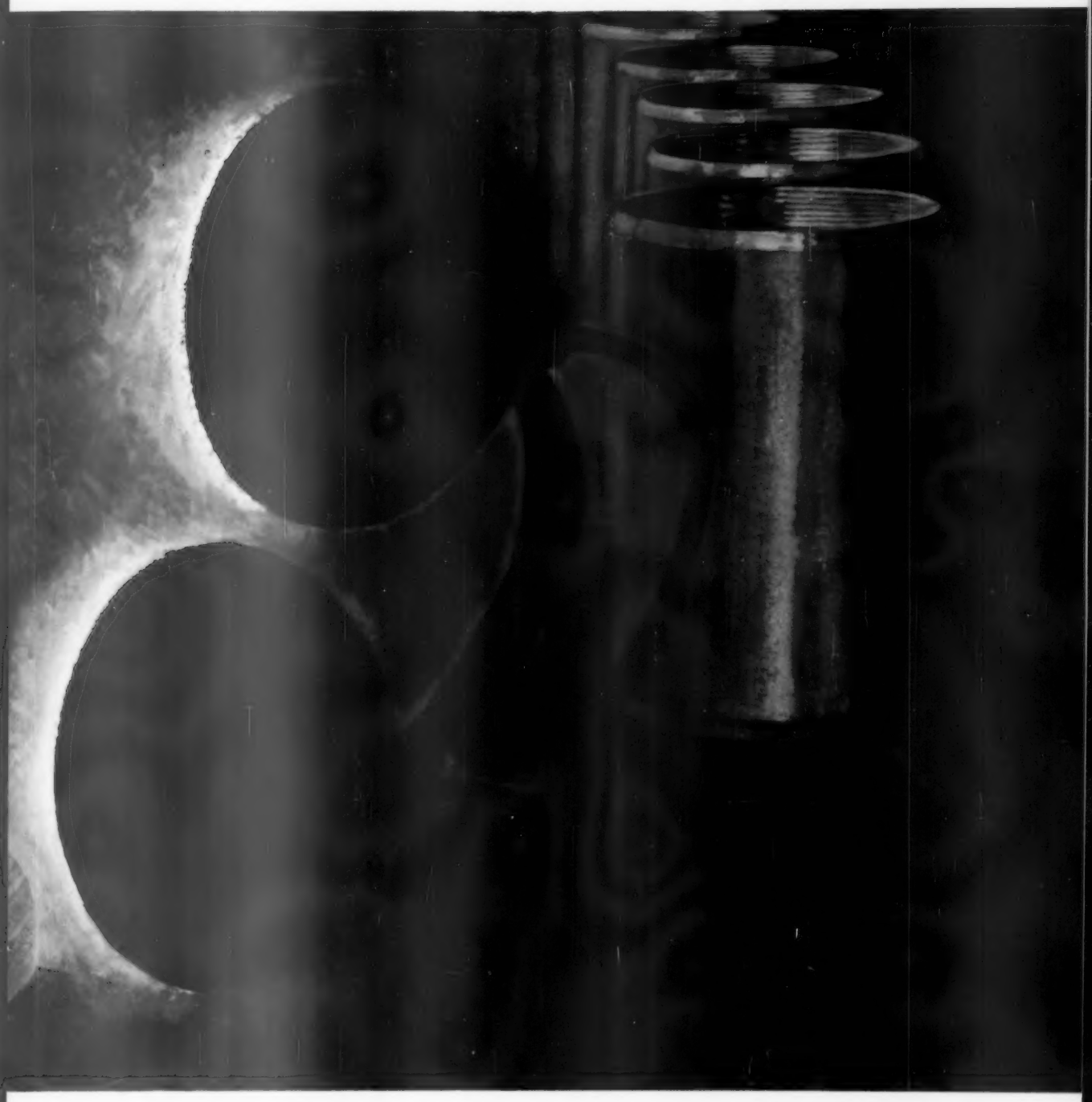
WAUKESHA MOTOR COMPANY, WAUKESHA, WISCONSIN / **New York • Tulsa • Los Angeles**
Factories: Waukesha, Wisconsin and Clinton, Iowa

Look what's getting the 3rd degree

Illuminated by the weird glow of two powerful ultra-violet lamps, this casing coupling is sweating out a check for possible imperfections. It's a process known as Magnaglo inspection. Here a special-clearance coupling is being inspected.

The coupling is magnetized; then drenched with a reddish-brown solution that contains magnetic particles coated with fluorescent dye. If there is a surface defect on the coupling, fluorescent particles cling to it—held by the magnetic field which builds up around any imperfection in the steel.

The inspector then slowly rotates the coupling on a potter's wheel. He scans it carefully for any tell-tale



gleam that clearly indicates an imperfection.

Magnaglo inspection is only one of the many quality control methods used by National Tube during the production of USS National Seamless Oil Country Tubular Products. If you've got a tough oil country tubular problem, write National Tube Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pa.

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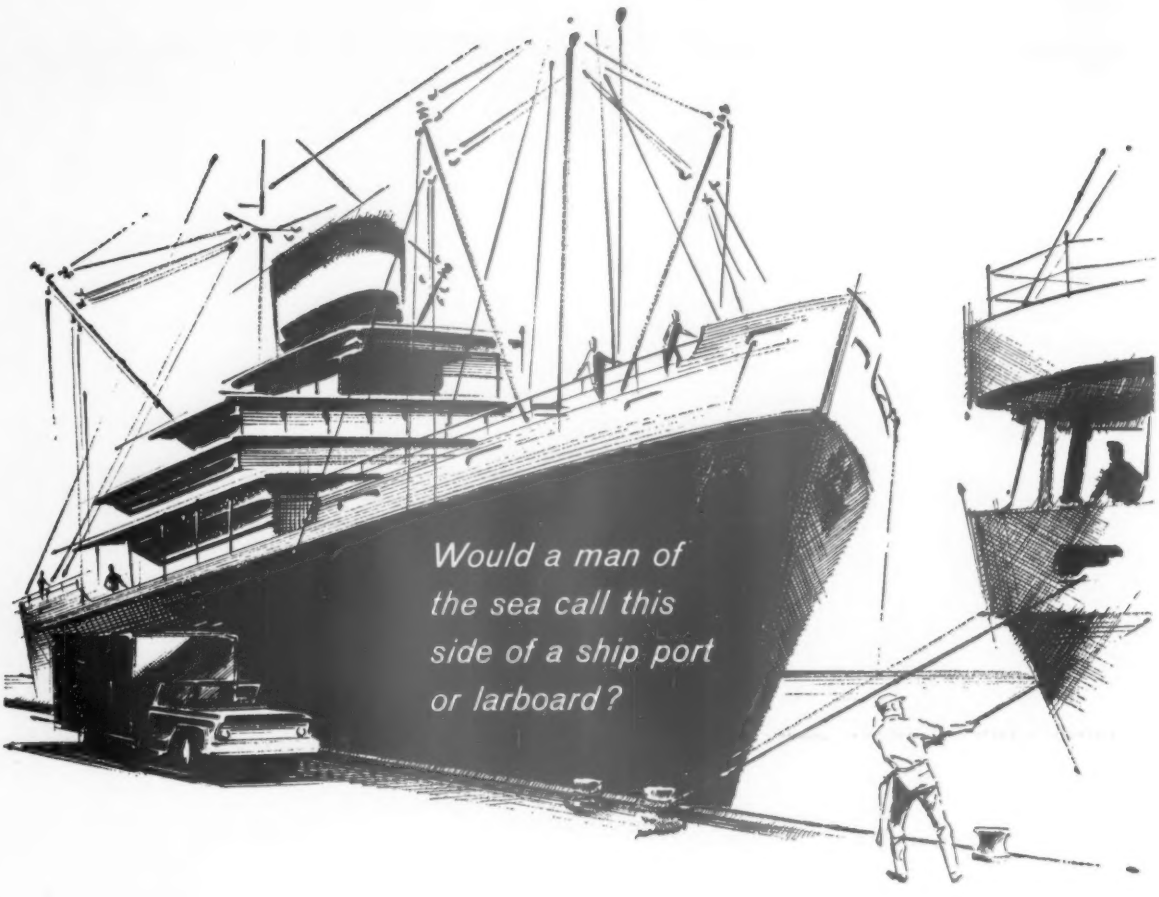


Can you tell the real thing when you see it?

This much about water-borne vessels is clear: They carry their cargoes at low cost.

Can you take advantage of this fact? We ship liquid caustic by barge from our Michigan and Louisiana plants. We know that many caustic users who should be receiving barge shipments aren't doing so. If you are situated near a navigable waterway, you may be one of them. We'd like to help you find out.

Call on us for caustic by barge . . . or truck, or tank car. An analysis of your position is part of the package.

Wyandotte offers a number of chemicals for the petroleum industry, including materials for drilling muds, gas dehumidification, demulsifying, emulsifying, secondary recovery, water treatment, cementing, sweetening, and many other petroleum, refinery, and petrochemical applications. Get full details from your distributor, or write: *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Baton Rouge, Louisiana. Offices in principal cities.*

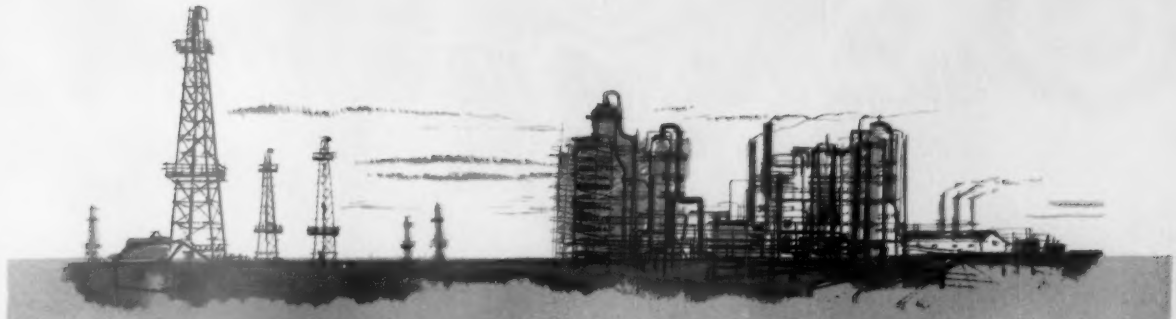
ANSWER: Neither. This is the right-hand or *starboard* side of the ship. The left side, which was once called *larboard*, is now called *port*.

* * * * *

WYANDOTTE CHEMICALS

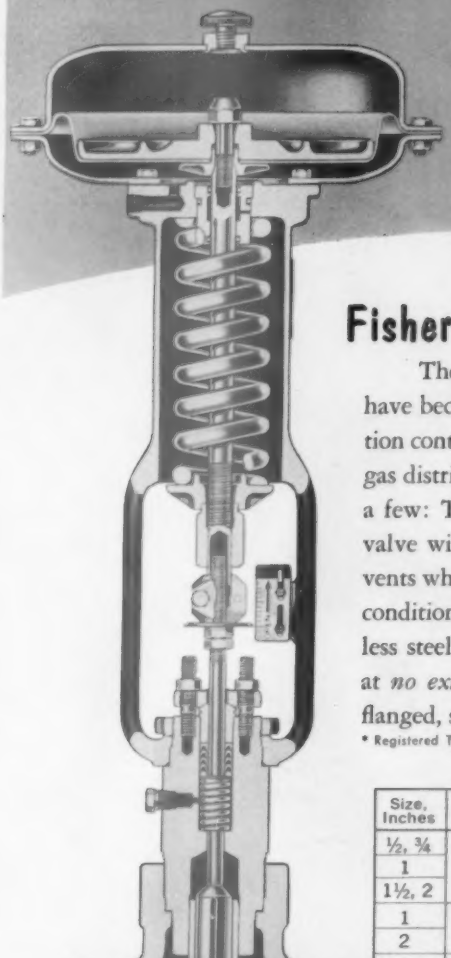
MICHIGAN ALKALI DIVISION

Pacing progress with creative chemistry®



NO WHIPPING... NO VIBRATION...

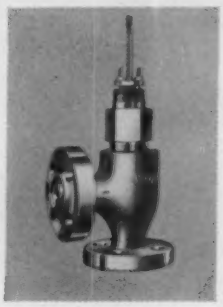
under high pressure drop conditions



Fisher High Pressure Cast Steel "D" Bodies

There's good reason why Fisher "D" bodies have become a standard item in oil and gas production control, and are also widely used in power plant, gas distribution and process industries. Here are just a few: The exclusive Fisher Micro-form Pup inner valve with rigid heavy duty extension guiding prevents whipping or vibration even under highest drop conditions. All "D" bodies are furnished with stainless steel trim and Stellite* on the seating surfaces at *no extra charge*. Can be supplied with screwed, flanged, socket or butt welding ends.

* Registered TM—HAYNES STELLITE



NOW AVAILABLE WITH INTEGRALLY CAST FLANGES

DESIGN "D" AND "DA" BODY AND ORIFICE SIZES

Size, Inches	Body End Connection	Body Pattern	Maximum Working Pressure	Orifice Size, Inches
½, ¾	Screwed	"D" Globe	3000 psi	⅛, ⅜, ½
1				¼, ⅜, ½, ¾
1½, 2				¼, ⅜, ½, ¾, 1
1	1500 lb. ASA Flanged			¼, ⅜, ½, ¾
2				¼, ⅜, ½, ¾, 1
1	Screwed or 2500 lb. ASA Flanged	"D" Globe	6000 psi	¼, ⅜, ½, ¾
2*				¼, ⅜, ½, ¾, 1
1	Screwed or 1500 lb. ASA Flanged	"DA" Angle	3000 psi	¼, ⅜, ½, ¾
2				¼, ⅜, ½, ¾, 1
1	Screwed or 2500 lb. ASA Flanged	"DA" Angle	6000 psi	¼, ⅜, ½, ¾
2*				¼, ⅜, ½, ¾, 1

*Also available with 10,000 lb. API flanges.

TYPE 667-D

Write today for further information

IF IT FLOWS THROUGH PIPE ANYWHERE IN THE WORLD . . . CHANCES ARE IT'S CONTROLLED BY . . .

FISHER GOVERNOR COMPANY

Marshalltown, Iowa / Woodstock, Ontario / Rochester, England

BUTTERFLY VALVE DIVISION: CONTINENTAL EQUIP. CO., CORAOPOLIS, PA.

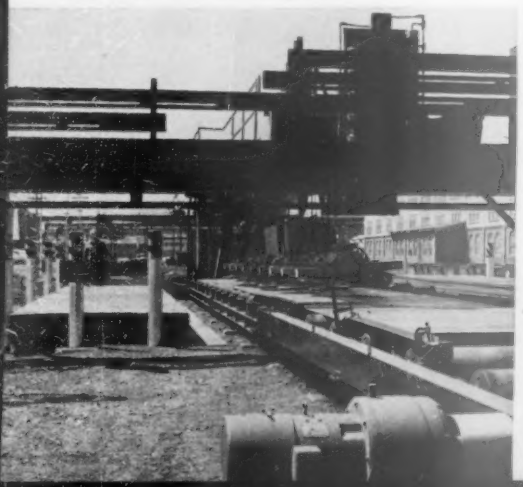
FISHER® Controls

SINCE 1880

Announcing a new mill...

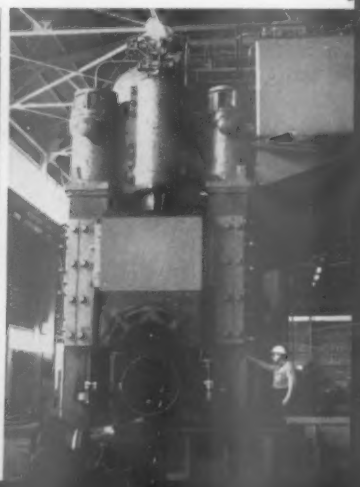
Steel *for Strength . . . Economy . . . Versatility*

The 40-ft-long plates are handled automatically by this unique one-legged gantry, and delivered to the edge- and end-facing machines.



The prepared plates enter the U-ing press, where they are formed in a matter of seconds. Then . . .

into the mammoth, 18,000-ton-capacity hydraulic O-ing press. This machine can readily form plate ¾ in. thick.



with monthly capacity of over

35,000 tons of LINE PIPE

. . . diameters to 42 in. OD . . . walls to 3/4 in.

We're now turning out electric fusion-weld line pipe (18 in. to 42 in. OD) in 40 ft lengths on our new mill at Steelton, Pa. The most modern in the industry, it assures Bethlehem customers of a plentiful supply of pipe meeting API 5LX specifications, as well as non-API pipe in the largest diameters and wall thicknesses presently available anywhere.

The mill's facilities, most of which are equipped with electronic controls, includes newly installed edge and end planers, U-ing and O-ing presses, and welding machines. The only "old" production facilities remaining are the hydraulic pipe expander and the end facer—both installed in 1957.

With this new mill in operation, Bethlehem can meet your most demanding requirements for quality, delivery, and size. The Bethlehem sales office nearest you will give you prompt action on your inquiries.

Line pipe to 16 in. OD made at Sparrows Point, Md.—Our modern electric resistance-weld mill produces API line pipe from 5-9/16 through 16 in. OD, in lengths to 60 ft. We also produce continuous buttweld pipe from 1/2 through 4-1/2 in. OD.

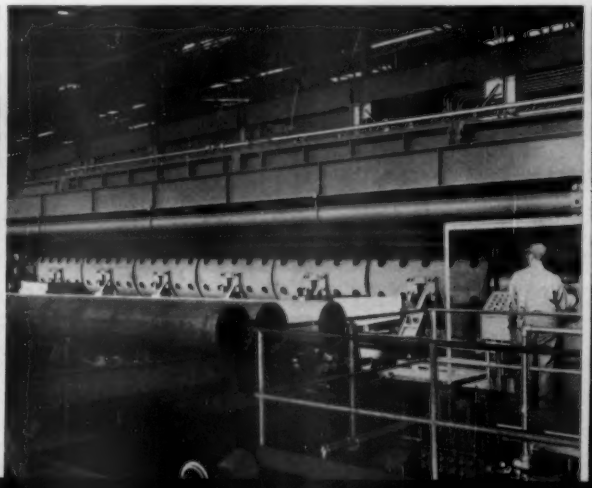
BETHLEHEM STEEL

BETHLEHEM STEEL COMPANY, Bethlehem, Pa.

EXPORT DISTRIBUTOR: Bethlehem Steel Export Corporation

One of the automatic submerged-arc welding machines making an inside seam. Not shown are the outside welders.

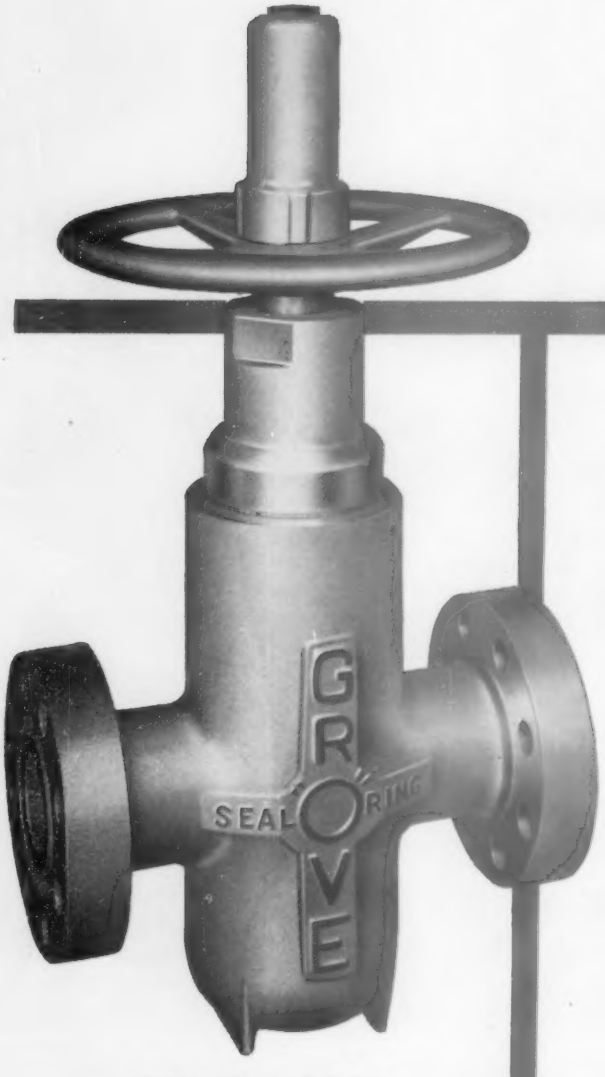
After thorough visual inspection the 40-ft lengths are fed into the hydraulic expander. It can expand pipe 42 in. OD, with ¾-in. walls.



After fluoroscopic inspection, the pipe is end-faced as shown here. This operation assures the proper bevel for field-welding.

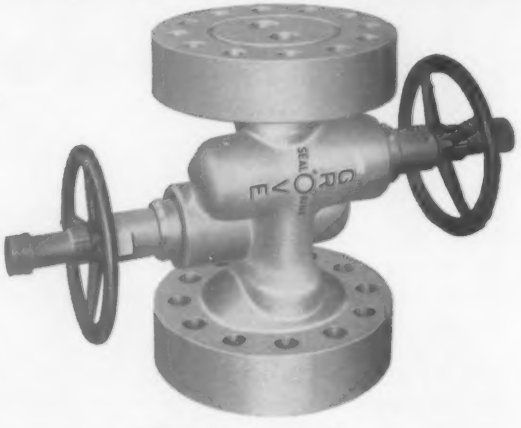
These Grove G-2 Seal-"O"-Ring® Valves
RIGHT OFF THE SHELF

These Grove series G-2 production valves are available right now in most sizes — more coming. They feature Grove Seal-"O"-Ring design and the Grove Valve **big plus** — no lubrication ever!

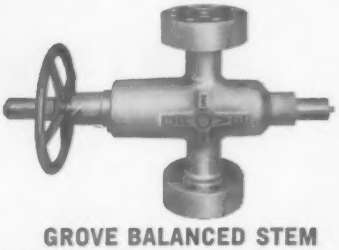


STANDARD GROVE G-2
Right-now shipment of standard series G-2 valves. Available in either flanged or screwed end. Sizes: 1½" through 4". Working pressure: 1000, 2000, 3000 and 5000 pounds.

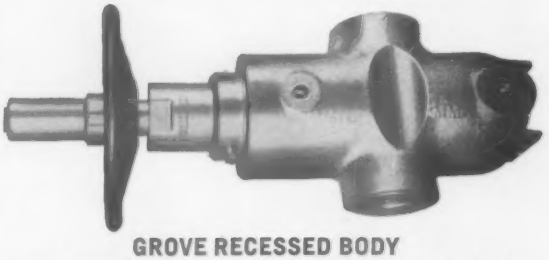
Write for Bulletin #581



GROVE DUAL BLOCK
Available in 2" — 5000 #W.O.G.



GROVE BALANCED STEM
Available in 2" x 1⅝", 2" x 1-13/16", 3" x 2-1/16", and 3½" x 2-9/16" — 10,000 #W.O.G.



GROVE RECESSED BODY
Available in 1½" and 2" — 2000, 3000 and 5000 #W.O.G.

GROVE PRODUCTION VALVES

GROVE VALVE and REGULATOR COMPANY
A Subsidiary of Walworth
Oakland 8, Calif. • Houston • Los Angeles • Odessa
Tulsa • Denver • Chicago • New York • Dallas
Pittsburgh • Farmington, N.M. • Lafayette, La.
Harvey, La. • Longview, Texas • Oklahoma City • Pampa, Texas • In Western Canada: Grove Valve Ltd., Edmonton

6321

NEWS FROM DOWN THE LINE!

NEW WmSON "PIG-SIG II" CAN BE INSTALLED OR REMOVED UNDER PRESSURE!

❷ "The Pig-Sig II with the Electrical Indicator can signal arrival of pig to pump station operator or start operation of automatic equipment to open and close valves."

❶ "The station operator knows the pig has arrived because the Pig-Sig II visual indicator is in the "passed" position. He no longer needs to wait and listen at the scraper trap."

❹ "This completely new Pig-Sig II uses a standard 2" Thread-O-Ring Nipple. Easily installed under pressure with WmSon Tapping Machines, using a standard drill.
The Pig-Sig II is available with either an electrical or visual signal, extended or regular."

❸ "This new, improved long trigger action detects scrapers even in oversize pipe. Pig-Sig II is excellent for use in metering or calibration."

"Pig-Sig II" Patent applied for

● Write Dept. A for Bulletin A-199

T.D. Williamson, Inc.

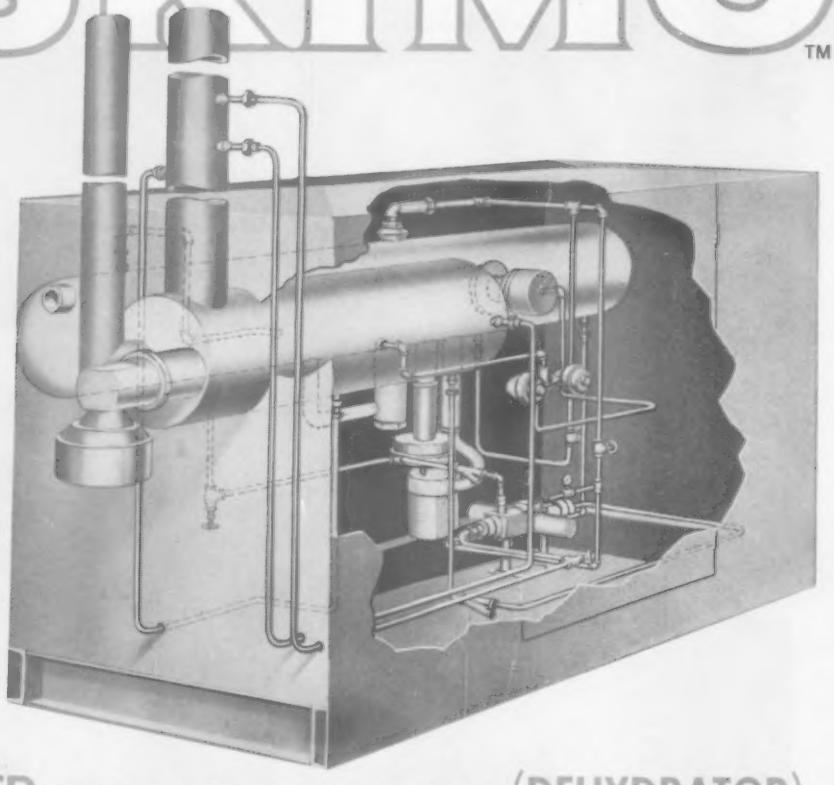
P. O. BOX 40 • TULSA 2, OKLAHOMA

REPRESENTATIVES AROUND THE WORLD

FOR ECONOMICAL AND EFFECTIVE DEHYDRATION OF SMALL VOLUME GAS WELL PRODUCTION IN ISOLATED LOCATIONS DURING EXTREMELY COLD WEATHER... BS&B NOW OFFERS

THE

ESKIMO™



EFFICIENCY
OVER 60 YEARS
BS&B
RELIABILITY
ANOTHER EXAMPLE OF PRODUCT LEADERSHIP

A SELF-CONTAINED GAS PRODUCTION UNIT (DEHYDRATOR) THAT HAS 3-PHASE RESOLUTION OF THE WELLSTREAM ...65° DEWPOINT DEPRESSION OF EFFLUENT GAS... HOUSED AND PROTECTED AGAINST EXTREME LOW AMBIENT TEMPERATURES... AND EQUIPPED WITH FLAME ARRESTORS FOR MAXIMUM SAFETY AGAINST FIRE HAZARDS IN THE ABSENCE OF ATTENDANT. AVAILABLE IN 2 MMSCFD AND 4 MMSCFD UNITS WITH 2 OR 3-PHASE INTEGRAL SCRUBBERS. ASK YOUR BS&B MAN, OR WRITE FOR INFORMATION TO DEPT. 1-A9, P. O. BOX 1714, OKLAHOMA CITY.

BLACK, SIVALLS & BRYSON

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They Say—

Credit due

Dear Sir:

We wish to express our pleasure at the generally excellent presentation your Journal has given the article by Anderson and Sommer on the use of helicopters and Tellurometers in the geodetic survey in our operations in Iran (OGJ, April 25, p. 142).

We appreciate the generally excellent editing. However, there has been an unfortunate omission of credit to that excellent cooperation of the National Cartographic Centre, an agency of the Plan Organization in Iran.

The National Cartographic Centre was nominated by the National Iranian Oil Co. as their technical representative to afford technical supervision on behalf of the National Iranian Oil Co. throughout the project of the boundary identification survey, and thereby establish the survey as definitive.

E. W. Berlin
General Managing Director
Iranian Oil Exploration & Producing Co.
Iranian Oil Refining Co.
Teheran, Iran

Objectionable implications

Dear Sir:

The article published August 15 page 86 ("Deals Speed Amazing Hess Growth") ostensibly concerns itself with the sale by Gulf Refining Co. of its tidewater terminal facilities at Mobile, Ala., and of its pipeline connecting that terminal with nearby Mississippi oil fields at Baxterville and Eucutta, to Hess and Scurlock. But the article also disseminated the following purported facts:

1. That Gulf Oil Corp., by virtue of its ownership of an overriding royalty interest with respect to certain producing leases in the Citronelle field, can or does influence pricing or sales policies with respect to Citronelle field.

The fact is that last month Gulf's royalty oil (it owns no working interests worth mentioning) amounted to less than 1½% of the entire field production. Gulf has no commitments from any producer or operator in the field such as to enable it to influence pricing or marketing policies, and it has indicated no desire to do so.

2. The implication was left that field production is declining significantly, even after taking into account

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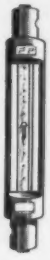

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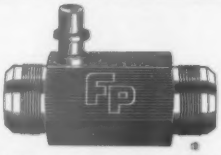

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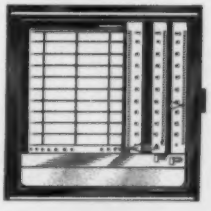

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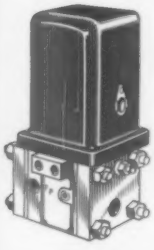

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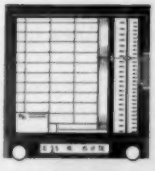

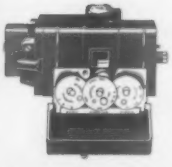

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production brought in by the drilling of new wells.

The fact is that until April the field was under purchaser proration, and had been under proration for almost 2 years, during which period approximately one half of all the wells in the field were drilled.

The only opportunity, therefore, which the producers in the field have had to ascertain its productive capacity has been during the months of May, June, and July, 1960. This company and Douglas Oil Purchasing Co., Inc., purchase all of the oil produced in the field and maintain up-to-date production and marketing records.

We have not thus far been able to ascertain that there has been any significant decline in field production, or any indication of it, although such will certainly take place over a period of time, as in all oil fields, even with new drilling, unless secondary recovery procedures are put into effect.

3. That Citronelle crude has peculiar characteristics which make it unattractive to most refiners.

The fact is that a number of refiners have found the crude to be a highly satisfactory general purpose crude, and the difficulty which has heretofore existed as regards finding a constant market for Citronelle crude was demonstrably caused by the generally glutted condition of the crude market, rather than by the specifications of the crude. The fact further is that at this time this company has offers from responsible purchasers to buy Citronelle crude in volumes exceeding the productive capacity of the field.

4. It was implied that this company tried unsuccessfully to sell crude to Hess.

You have your facts in reverse. Last year an offer by persons claiming to represent Hess to purchase Citronelle crude was rejected and would be rejected if tendered today.

Bart B. Chamberlain, Jr.
Citronelle-Mobile Gathering System Co., Ltd.
Mobile, Ala.

Editor's note: Reader Chamberlain's points are well taken. The Journal did not intend to imply that Citronelle's future is anything but bright. The prospects for raising production through unitization and secondary recovery portend a steady market at a fair price for this important field.

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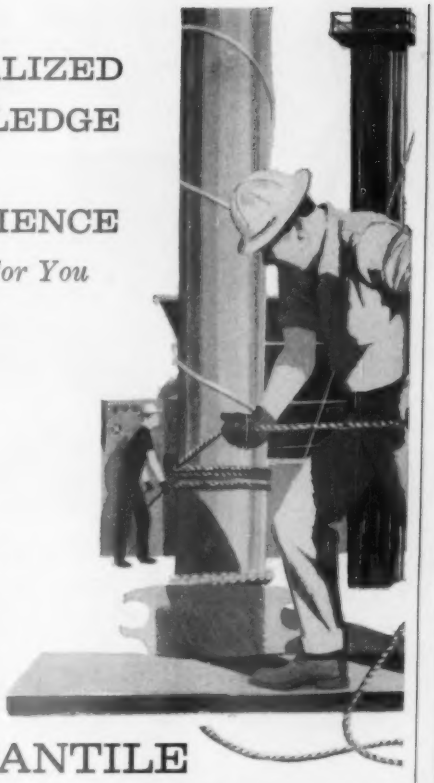

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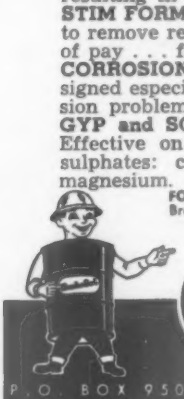

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Shaikh Abdullah Tariki, Saudi Arabian director general of petroleum and mineral affairs, in an interview granted Al Nadwah, Mecca daily newspaper.

CALENDAR

SEPTEMBER

11-13 New Mexico Petroleum Industries Committee, annual convention, Western Skies Hotel, Albuquerque.

11-16 American Chemical Society, national meeting, New York City.

14-15 Western Petroleum Refiners Association, Rocky Mountain regional technical-industrial relations meeting, Henning Hotel, Casper, Wyo.

14-16 National Petroleum Association, annual meeting, Traymore Hotel, Atlantic City, N. J.

14-16 National Industrial Conference Board, eighth annual marketing conference, Waldorf-Astoria Hotel, New York.

15 Natural Gasoline Association of America, Rocky Mountain regional meeting, Palliser Hotel, Calgary.

15-16 American Institute of Mining, Metallurgical, and Petroleum Engineers, annual engineering management conference, Morrison Hotel, Chicago.

16-17 Kansas Geological Society, twenty-fifth annual field conference, northeastern Oklahoma, Western Hills Lodge, Wagoner, Okla.

18-21 American Society of Mechanical Engineers, petroleum mechanical engineering conference, Jung Hotel, New Orleans.

19-21 Texas Mid-Continent Oil and Gas Association, annual meeting, Granada Hotel, San Antonio, Tex.

20-21 Illinois oil industry convention, sponsored by Illinois Oil and Gas Association, Illinois Oil Council, Illinois Petroleum Marketers Association, and Chicago Gasoline Jobbers Association, St. Nicholas Hotel, Springfield.

20-21 Ohio Petroleum Marketers Association, fall conference, Netherland-Hilton Hotel, Cincinnati.

21 American Petroleum Institute, Coalinga-Kettleman chapter, annual barbecue and golf tournament, Polvadero Country Club.

21-23 Pacific Coast Gas Association, annual meeting, Westward Ho Hotel, Phoenix.

25-27 American Association of Oilwell Drilling Contractors, annual meeting, Roosevelt Hotel, New Orleans.

25-28 American Institute of Chemical Engineers, meeting, Mayo Hotel, Tulsa.

25-28 American Institute of Electrical Engineers, petroleum industry committee, electrical conference of the petroleum industry, Hotel Skirvin, Oklahoma City.

26-29 American Welding Society, fall meeting, Penn-Sheraton Hotel, Pittsburgh.

26-30 Instrument Society of America, instrument-automation conference and

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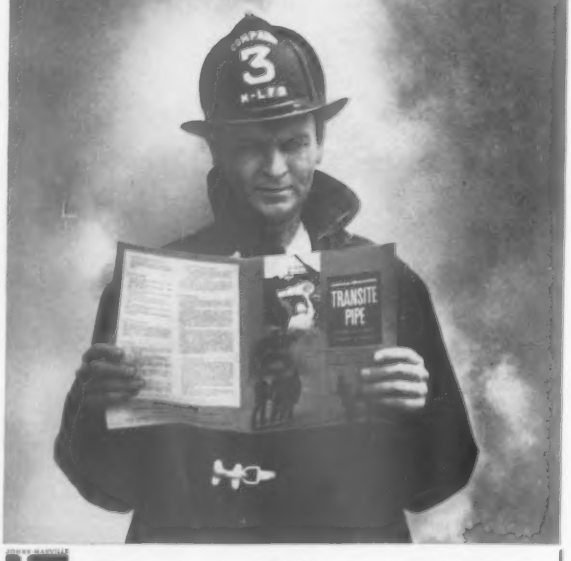

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27-29 Mid-West Gas Association, annual school and conference, Memorial Union, Iowa State College, Ames.

28-30 University of Oklahoma and National Association of Corrosion Engineers, central Oklahoma section, seventh annual corrosion control short course, North Campus, University of Oklahoma, Norman.

29-30 Mid-Continent Oil and Gas Association, Mississippi - Alabama division meeting, Grand Hotel, Point Clear, Ala.

29-Oct. 1 West Texas Geological Society, field trip, Delaware basin of West Texas and southeast New Mexico.

OCTOBER

2-5 Society of Petroleum Engineers of AIME, annual fall meeting, Denver.

3-4 Independent Natural Gas Association of America, annual meeting, Fontainebleau Hotel, Miami Beach.

4-5 University of Kansas, gas-measurement institute, National Guard Armory, Liberal, Kans.

5 Society of Plastics Engineers, Inc., regional technical conference, Mark Hopkins Hotel, San Francisco.

6-7 National Association of Corrosion Engineers, annual western region conference, Sheraton - Palace Hotel. San Francisco.

6-8 National Association of Corrosion Engineers, southeast region conference, Dinkler-Plaza Hotel, Atlanta, Ga.

6-8 National Academy of Sciences, National Research Council, ninth national clay conference, Purdue University, Lafayette, Ind.

10-12 American Gas Association, annual convention, Atlantic City.

11-14 National Association of Corrosion Engineers, northeast region conference, Prichard Hotel, Huntington, W. Va.

12-14 Southwestern Federation of Geological Societies, annual meeting, Wooten Hotel, Abilene, Tex.

13-14 California Natural Gasoline Association, annual fall meeting, Hotel Miramar, Santa Monica, Calif.

13-15 Southwestern Legal Foundation, American Association of Petroleum Landmen, second national institute for petroleum landmen, Dallas.

13-16 Taft, Calif., Oildorado, fiftieth anniversary celebration.

14-15 University of Texas, E. P. Schoch lecture series on rate processes, Batts Hall Auditorium, Austin.

14-16 New Mexico Geological Society, annual field conference, Chama basin of northern New Mexico, registration, Taos, Oct. 13.

17-19 American Society of Mechanical Engineers, American Society of Lubrication Engineers, lubrication conference, Statler Hilton Hotel, Boston.

17-19 University of Minnesota, Pennsylvania State University, Colorado School of Mines, biannual symposium on drilling and blasting, Golden, Colo.

17-Nov. 5 University of Oklahoma, School of Petroleum Engineering, short course in advanced drilling practices for engineers, University of Oklahoma, Norman.

19-20 National Association of Corrosion Engineers, north central region conference, Schroeder Hotel, Milwaukee.

19-21 Gulf Coast Association of Geological Societies, convention, Biloxi, Miss.

19-21 Rocky Mountain Oil and Gas As-

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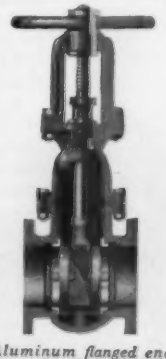

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sociation, annual convention, Brown Palace Hotel, Denver.

20-21 American Institute of Mining, Metallurgical, and Petroleum Engineers, Los Angeles Basin, fall meeting, Huntington Sheraton Hotel, Pasadena, Calif.

20-23 Permian Basin Oil Show, Odessa, Tex.

23-25 Independent Petroleum Association of America, annual meeting, Statler-Hilton Hotel, Dallas.

24-25 American Society of Mechanical Engineers, American Institute of Electrical Engineers, fuels conference, Daniel Boone Hotel, Charleston, W. Va.

25-28 National Association of Corrosion Engineers, south central region conference, Mayo Hotel, Tulsa.

26-27 Armour Research Foundation of Illinois Institute of Technology, computer applications symposium, Morrison Hotel, Chicago.

26-27 Western Petroleum Refiners Association, annual question and answer session on refining technology, Rufus Garrett Hotel, El Dorado, Ark.

28 Natural Gasoline Association of America, southern regional meeting, Carlton Hotel, Tyler, Tex.

31-Nov. 4 University of Oklahoma, petroleum landmen's institute, Student Union Building, University of Oklahoma, Norman.

NOVEMBER

3 West Central Texas Oil and Gas Association, annual meeting, Hotel Windsor, Abilene, Tex.

3-4 American Association of Petroleum Geologists, Pacific section, annual meeting, Ambassador Hotel, Los Angeles.

3-4 Society of Automotive Engineers, national fuels and lubricants meeting, Mayo Hotel, Tulsa.

6-9 Chemical Institute of Canada, chemical engineering division, conference, Quebec City.

7-10 Society of Exploration Geophysicists, international meeting, Moody Convention Center, Galveston, Tex.

14-16 American Petroleum Institute, fortieth annual meeting, Conrad Hilton, Palmer House and Congress hotels, Chicago.

14-16 Society of Petroleum Engineers of AIME, Venezuelan sections, fourth annual meeting, Maracaibo, Venezuela.

15-16 University of Kansas, natural-gas pipeline institute, Courthouse, Liberal, Kans.

15-17 Southwest Research Institute, Air Force, Navy, industry propulsion systems lubricants conference, Hilton Hotel, San Antonio, Tex.

18 Natural Gasoline Association of America, Panhandle Plains regional meeting, Herring Hotel, Amarillo, Tex.

27-Dec. 2 American Society of Mechanical Engineers, winter annual meeting, Statler Hilton Hotel, New York.

DECEMBER

4-7 American Institute of Chemical Engineers, meeting, Statler Hotel, Washington.

5-7 Interstate Oil Compact Commission, annual meeting, Westward Ho Hotel, Phoenix.

9 Tulane University, School of Law, and American Association of Oilwell Drilling Contractors, fifth annual program on mineral and tidelands law, University Center, Tulane University, New Orleans.

WHAT'S 1 OUT OF 1000 TO YOU?

In cat cracking, minute percentages in the collection efficiency of catalyst recovery systems can make the difference between an economical and a completely undesirable operation. One tenth of 1% loss in efficiency in a large cat cracker can result in an increased carryover of more than 70 tons of catalyst per day. At $250 a ton, this can amount to over $17,000 . . . a lot of reason to specify the most efficient system . . . Buell Cyclones. Only Buell Cyclones have the exclusive Shave-Off that guarantees the extra efficiency necessary for continuous high-recovery results. And only Buell has the accumulated know-how derived from more than 25 years of experience in hundreds of refinery installations. Buell Engineering Co., 123 William St., New York 38, N. Y. Northern Blower Division, 6409 Barberton Ave., Cleveland, Ohio. (Subsidiary: Ambuco Limited, London, England).

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- ELECTRIC PRECIPITATORS
- BAG COLLECTORS
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IF YOU'RE CONCERNED ABOUT
CHEMICAL PRODUCTION COSTS,
YOU'LL LIKE DOING BUSINESS WITH
COLUMBIA-SOUTHERN

A complete appraisal of your chemical purchasing practices might reveal areas where you can make significant savings . . . and your Columbia-Southern Representative is fully equipped to help you do such a job.

He'll help you determine whether you're set up for the most economical chemical storage and handling, for one thing. And he'll survey the various forms and grades of chemicals you are buying now. Very often a small change can result in big savings.

Another area you can explore together is delivery procedure. Are you using the best means of transportation to insure prompt delivery at the most reasonable costs?

Get in touch with your Columbia-Southern Representative, and review these questions with him. You'll be glad you did.

Columbia-Southern Chemical Corporation, One Gateway Center, Pittsburgh 22, Pa. Offices in fourteen principal cities. In Canada: Standard Chemical Limited.

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A Subsidiary of Pittsburgh Plate Glass Company

Chlorine • Caustic Soda • Caustic Potash • Soda Ash • Ammonia
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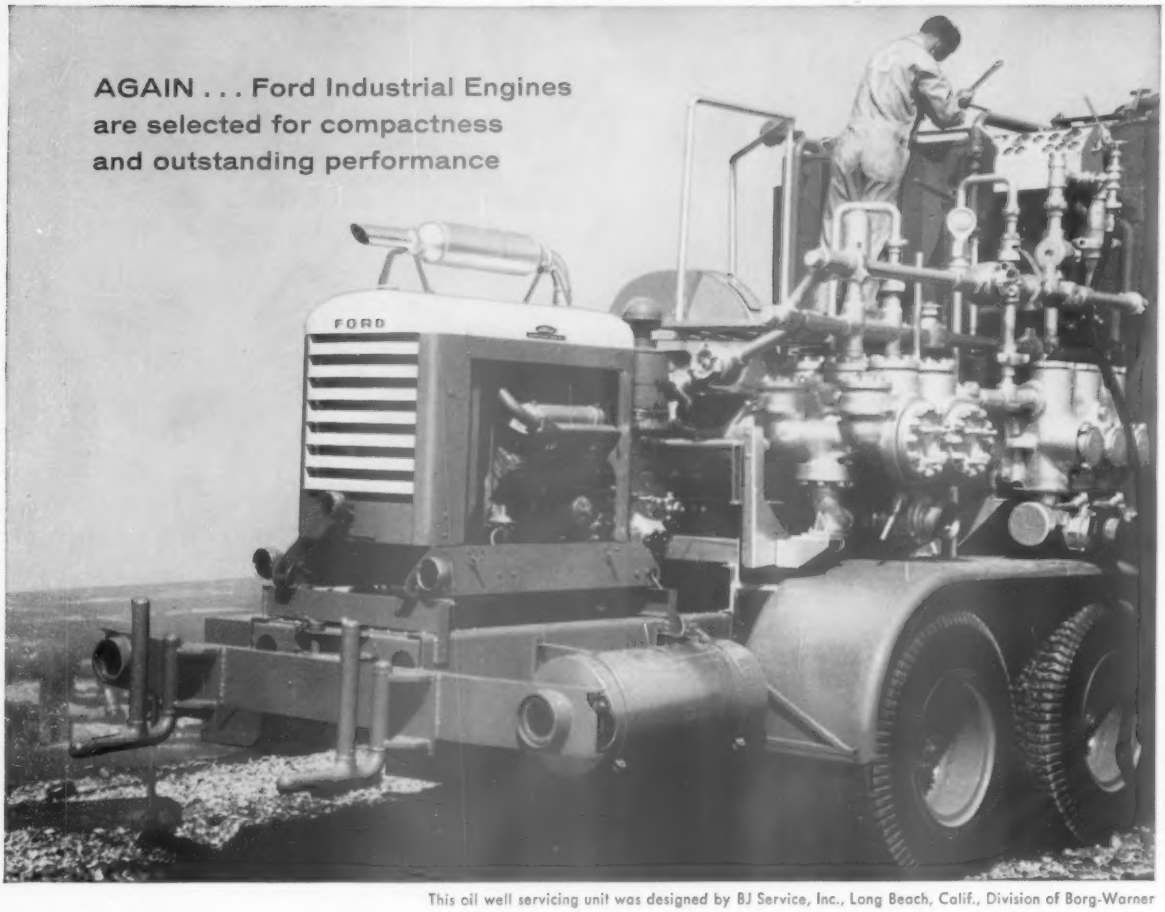
Barium Chemicals • Sulfur Chemicals • Agricultural Chemicals
Reinforcing Pigments • Calcium Chloride • Hydrogen Peroxide
Muriatic Acid • Calcium Hypochlorite • Titanium Tetrachloride



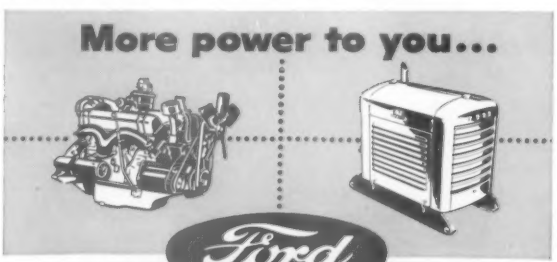
This oil well servicing unit was designed by BJ Service, Inc., Long Beach, Calif., Division of Borg-Warner

Powerful but lightweight Ford engine helps new cementing rig keep within road weight limits!

There's no place for "dead weight" on an efficient piece of equipment like this oil well servicing unit—designed by BJ Service, Inc. That's one big reason BJ Service chose a Ford 332 Power Unit as an important power component.

Don Kliment, manager of manufacturing for BJ Service, says, "Our equipment is extremely heavy . . . usually barely within road weight limitations. We found this particular Ford engine to be exactly what we needed, inasmuch as it supplied the needed power yet was light enough to meet our specs. The fact that it's a good serviceable engine, plus excellent availability of parts, also helped swing us to Ford."

You, too, can enjoy the proven dependability, greater operating efficiency and economy that come with Ford power. Ford engines are available in a wide variety of models—ranging from 134 to 534 cubic inches . . . including two modern Ford Diesels. To get the most for your power dollar, specify Ford engines—*the engines that give you more horsepower per pound of weight than ever before possible.*



FORD POWER IS RIGHT FOR YOUR OIL FIELD EQUIPMENT, TOO!

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INDUSTRIAL ENGINES
AND POWER UNITS

INDUSTRIAL ENGINE DEPARTMENT, FORD DIVISION, FORD MOTOR CO., P.O. BOX 598, DEARBORN, MICH.

West of Rockies write to:
FORD INDUSTRIAL ENGINE DEPT., P.O. BOX 6787, LOS ANGELES 22, CALIF.
FORD INDUSTRIAL ENGINE DEPT., P.O. BOX 1666, RICHMOND, CALIF.

the Journal said ...

50 years ago

September 15, 1910

Cities Service Co. is incorporated in Delaware with capitalization of $50,000,000 as a holding company for the merger of Denver Gas & Electric Co., Empire District Electric Co., and Spokane Gas & Fuel Co.

Market price of California crude oil drops from an average of 50 cents to 30 cents a barrel. Kerosine in eastern markets cut to 4 cents per gallon.

Prairie Oil & Gas Co., Standard Oil Co. subsidiary, takes over the producing properties and leases of John H. Markham, Jr., in the Delaware district, in Nowata County, Oklahoma. Involved in the $500,000 purchase are 75 wells with daily production of 2,500 bbl. on 1,200 acres.

25 years ago

September 12, 1935

Death ends long career of E. L. Doheny, 79 years old, world-famous successful wildcatter, oil and gas producer and developer, transporter and marketer.

Completion of second well 1½ miles northeast of discovery producer with flow of more than 10,000 bbl. in 24 hours marks newly opened Rodessa field, in northwestern Louisiana, as a major play and a threat to stability of oil-price structure.

Four companies (White Eagle Division of Socony-Vacuum Corp., The Texas Co., Phillips Petroleum Co., and Empire Gas & Fuel Co.) join in building six-county, central and western Kansas gathering and pipeline system to provide relief for many fields and producers without outlet, and open way for long-delayed development program.

10 years ago

September 14, 1950

Reported oil showings in South-Central Oregon wildcat stirs prospects for commercial oil production in Pacific Northwest. Industry looks to Tri-State Gas & Petroleum, Ltd., test in Lake County as possible first producer in 1,200-ft. horizon.

Sun Pipe Line Co. acquires Stanolind Oil & Gas Co.'s (Pan American) outstanding third interest to give it full ownership of Sun-Yount Lee Pipe Line Co.'s East Texas-Gulf Coast pipeline system.

Federal agencies perfect plans to administer oil-industry controls under Defense Production Act just passed by Congress. President creates two new agencies under Interior and Commerce Departments to guide war production and economic stability.

JOURNALLY SPEAKING

Look, Ma—No Wheels!

THE OIL INDUSTRY'S scientists don't seem to have much vision. Neither do Detroit's automotive engineers. They're all in a rut.

Why, just the other day we read where a bunch from both groups got together to dope out the future trends of automobile use and the fuel requirements of the cars of tomorrow.

And what did they come up with? The same old stuff: Octane requirements will increase a little bit then level off; turbines will never replace conventional piston engines in passenger cars; small diesel engines may find a growing use in trucks and taxis; a higher percentage of new cars may be compacts, but gasoline demand is going to keep on going up and up.

Those guys must not read the newspapers.

Just about the time this group was meeting we read a newspaper interview with an engineer-forecaster who made them all look like squares. This fellow is real cool—way out there, man. He's got some predictions on the future of the automotive industry that are *really* predictions.

By 1970, predicts he, the late-model cars won't have wheels at all. They will glide along over land or water on a cushion of air supplied by a horizontal fan on the bottom, and propelled by jets of gas or compressed air.

So, scratch the entire market for running-gear, differential, and chassis lubricants.

As if that weren't a grim enough outlook, this prescient predictor says confidently that within 5 years after that cars won't have engines either. They will be powered either by thermonuclear devices or by lightweight, highly efficient fuel cells operating on small amounts of some high-energy chemical.

Scratch the entire gasoline market.

But that ain't all. Having eliminated first the wheels and then the engines, this fellow proceeds to eliminate what's left of the car. By 1980, if the newspaper interviewer got him straight, people won't have any use for cars at all. They will propel themselves through the air by means of a jet "levitator" the size of a teacup strapped to their backs. Or, if a jet-propelled knapsack is too undignified, they can hook the gadget to a sort of wheelless bicycle frame or baby buggy and effortlessly go about their shopping, commuting, and business trips.

By that time, it appears, science will have caught up with science-fiction, and we wonder what the science-fiction writers will write about.

More to the point, we wonder what oil writers will write about.

We can't write about automobiles, because there won't be any. We can't write about gasoline demand, because there won't be any of that. And since these jet-propelled air cars won't need highways there will be no gasoline taxes to fume over.

And we can't write about the oil business either, because, if this guy's predictions come true, there won't be any oil business.

Maybe we're a square, too, but we just can't bring ourself to believe that there won't be any oil business in 20 years—or 200 years. There must be some flaws in this fellow's predictions somewhere.

Or, even if the museums of antiquity are preparing a place for the gasoline automobile alongside the horse-drawn surrey and the steam locomotive, we feel that the oil industry will be able to find some new uses for the liquid energy it is able to extract from Mother Earth in such profusion.

But it may have to hump itself to do that. At the pace that science and invention are moving these days it is not at all impossible that the principal uses of petroleum may soon be quite different from those we know today. And oil men may have to move fast to keep tuned in on shifting market demands.

So, all you squares, don't sneer too complacently at predictions of a wheelless, carless, gasolineless society. There just possibly might be something to them.

—Henry D. Ralph

MOST RESPECTED PACKER

It's known the world over for sheer downright dependability

BAKER RETAINER
PRODUCTION PACKER
PRODUCT 415-D

THE DOUBTS that harass well operators got a real body blow when the now-celebrated Baker Retainer Production Packer was developed some years ago.

This is probably the most predictable (and certainly the most respected) packer ever to go into an oil well. It commands the respect and confidence of operators the world over.

WHAT'S THE SECRET of building a packer so tough and reliable you know it will keep you honest when you recommend it?

For one thing, it takes time—years of performance studies. We've sweated out failures and assessed our successes—sifted out weak points and strengthened the strong points.

This great packer is at work right now in tens of thousands of wells—the average wells, the corrosive wells, the deep, hot, high pressure wells.

THAT'S A TOUGH proving ground—one that has helped us soak up a vast knowledge of what happens to slips, packing elements, and the like, when a packer is downhole. We've got the facts.

Baker made the first retainer packer—for many years the *only* retainer-type packer. The result is a wealth of packer experience that's hard to equal.

This remarkable packer shows it. Over the years we've refined it into a tool that has unyielding stamina. That's why we can call it the most predictable packer of them all.

This great packer has many applications—it's as versatile as it is dependable. It's a single-string production packer that comes in many sizes and bores. Moreover, it is surrounded by a family of accessories that transform it into a dual or triple packer—or into a temporary or permanent bridge plug or squeeze tool. Its formidable pressure-holding capacity makes it in many ways one of the finest of all squeeze packers.

It is set on a wire line—or on tubing or drill pipe. Baker's fast new milling tool mills one out in two to four hours—a fourth the time it once took.

For the latest practical knowledge of how to use Baker Retainer Production Packers, call your Baker Representative.

BAKER
RETAINER PRODUCTION PACKER

BAKER OIL TOOLS, INC. HOUSTON / LOS ANGELES / NEW YORK

Marketers are beginning to look at themselves

A QUIET REVOLUTION has begun in oil marketing. If pursued, it could substantially reduce many chronic causes of low profits and bolster the entire industry's financial structure.

Most companies don't like to talk much about it because change implies a confession of past error. Also oil marketing is such a sensitive subject that any experiment could bring premature criticism.

But many companies are critically reexamining their marketing policies and practices, thinking up different approaches to old problems, and cautiously testing new ideas.

HERE ARE SOME of the conclusions that the marketing divisions of several major companies are reaching:

The dealer is the most important factor in successful marketing—more important than station location, advertising campaigns, or price. So dealers are being better selected and trained, and their status is being enhanced by giving them added responsibility and authority.

Some new methods of retailing, largely developed by aggressive independents, offer real economies and advantages and should not be fought as simply a price-cutting gimmick. An example would be a high-volume, low-unit-cost station at a highway junction.

Much money has been lost by maintaining stations that are obsolete in design, poorly located, improperly manned, with inadequate access or facilities, or with too small a volume potential. Many companies are closing such stations as fast as possible.

Marketing and pricing policies have encouraged senseless price wars, and methods used to combat them have actually spread and prolonged the wars. An example is dealers' margin guarantees which have been so loose and liberal as to defeat their original purpose.

Majors often cut their own throats by blanket policies of giving all price cutters a dose of their own medicine. Not all low-price stations are vicious price cutters or fly-by-night opportunists, and it is more profitable to ignore some of them than to lower all prices in the area.

Much marginal and fringe business obtained in a race for gallonage is uneconomic to serve and can be surrendered without loss of profit.

OUTSIDE CRITICS of the oil business have often observed that one-time leaders in the industry have exhibited very little leadership in recent years, and that most of the innovations in oil marketing have come from independents.

Certainly not all such innovations are bad and deserving of dogged opposition and suppression by the majors.

It is good to see so many companies now taking a fresh look at the real needs of marketing and beginning to test out policies that may restore strong leadership in this most important branch of the industry.

WITH DOWELL ENGINEERED ACIDIZING . . .

OPERATOR MAKES WELL BETTER THAN NEW

Engineered acidizing by Dowell is helping operators improve wells in many ways.

Dowell engineers use the "Acid Guide*" to design treatments for better results, lower costs, or both. Also, more and more, Dowell-developed services such as Abrasijet* (abrasive jetting service) and Rockshock* (implosive formation-treating service) are being used to pave the way for more effective acid treatments. In some instances, their use has resulted in successful treatments under conditions that were considered impossible to overcome.

Here are four recent treatments that illustrate how Dowell engineers use acid to help operators get good wells. The first is a case where engineered acidizing actually made a well better than new.

PRODUCTION INCREASED 2½ TIMES AND GAS/OIL RATIO GREATLY IMPROVED

Production from a Pecos County, West Texas well had declined from 250 to 180 bopd. Original gas/oil ratio was 1077 but had increased to 1560. Then an acid treatment, engineered with the aid of the "Acid Guide," increased production to 460 bopd. The treatment also reduced the gas/oil ratio from 1560 to 770.

The original completion was made in June, 1954. Perforations were into the Silurian (Montoyo) pay from 5118 to 5129 feet.

The engineered acid treatment recommended by Dowell used 5000 gallons of acid with a Dowell demulsifying agent added. Injection rate was five bpm at 2200 psi.

Despite the fact that the well is more than five years old, production is now considerably better than it was when the well was new.

WATER SHUT OFF--OIL PRODUCTION RESTORED WITH ABRASIJET AND MUD ACID

In Jones County, North Texas, an old well had gone to 100 per cent water. The well was completed open hole in the Palo Pinto sand between 3100 and 3260 feet. A Dowell water locator showed water entry in the zone below 3230 feet, so this zone was squeezed off with cement.

Then, Abrasijet was used to enlarge the hole and clean the formation at the most productive levels. Next, the well was acidized with 250 gallons of Mud Acid.

After clean-up, production was 56 bopd with **no water.** The operator saved a well that might otherwise have been abandoned.

KENTUCKY OPERATOR GETS 85 BOPD WELL IN AN AREA OF 15 BOPD PRODUCERS

A Dowell acid treatment resulted in a 30-day test of 85 bopd in an area where most wells drop to 15 bopd in the same period.

The well was in Muhlenburg County. Completion was through perforations into the O'Hara formation.

The Dowell treatment consisted of 1500 gallons acid with demulsifying and silicate control agents added. The operator credited these Dowell addition agents with the good results obtained.

DOWELL CUTS THROUGH TWO-FOOT MAGNESIUM BRIDGE PLUG IN SIX MINUTES

Dowell was called to acidize out a 9⅝" magnesium bridge plug that had set prematurely 90 feet below surface. The operator was afraid to drill because he could not get enough weight on the bit to balance the 2000 psi pressure below the plug.

Dowell engineers suggested the use of Abrasijet with acid. A special tool with two downward-pointing jets was run on 3½"-drill pipe and set about one inch above the plug. The pipe was held down with chains.

1000 gallons Dowell acid, carrying one pound sand per gallon, was pumped through the tool at 2500 psi. After six minutes, gas began to blow out the annulus, allowing pressure to equalize above and below the plug. The operator then went in with a bit and knocked the plug to bottom without difficulty.

Here is another example showing how Dowell uses acid **and engineering** to solve difficult problems and reduce costs. The plug was cut through in six minutes as compared to a normal drilling time of at least four hours.

Modern, **engineered** acid treatments as offered by Dowell can help producers increase their profits more than ever before. Call your Dowell representative for prompt service or detailed information. Dowell services and products are offered from more than 150 offices and stations in the United States, Canada, Venezuela and Argentina. Dowell, Tulsa 1, Oklahoma. *Dowell Trademark

Services for the oil industry

DOWELL

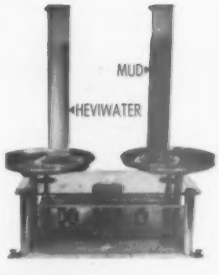
DIVISION OF THE DOW CHEMICAL COMPANY

MORE IDEAS FROM DOWELL

TO HELP YOU MAKE MORE PROFIT

HEVIWATER*

This new well completion fluid comes ready-mixed in a variety of weights. It is designed to be left, instead of mud, in the annulus above packers; also used as a protective fluid during perforating. Packer sticking and formation damage are avoided because it contains no undissolved solids. Presently stocked at Berwick, La.; can be made available at all Dowell stations.

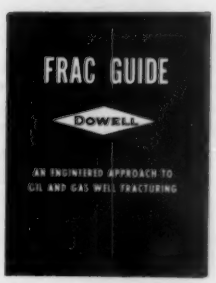


PARAFFIN INHIBITOR

This new Dowell material operates on an entirely different principle. The chemicals used do not dissolve paraffin, but are actually designed to prevent its deposition. Small amounts of the inhibitor are injected into the well periodically in the same manner as corrosion inhibitors. Careful preparation of the well is required before the treatment begins.

"FRAC GUIDE"

This Dowell collection of charts and formulas is arranged to aid in the more effective engineering of fracturing treatments. With the "Frac Guide," Dowell engineers can help you select the proper type and volume of fracturing fluids, sand sizes and quantities, injection rates and treating procedures — to give optimum results at the lowest possible cost.



Delivers a 300,000 pound "knock-out" punch; critical parts are 4340 nickel alloy steel

. . . it provides the hardness, impact resistance, and strength needed to withstand the shattering impact.

Every time this hydraulic "sledge hammer" is run down a well to free stuck pipe, 4340 nickel alloy steel is put through one of the severest tests of a metal's strength and impact properties.

Blows of over 300,000 pounds are delivered by this Bowen Hydraulic Rotary Jar when "fish" are stuck tightly. But time and time again, this through-hardening nickel alloy steel proves it has the high mechanical properties to withstand the crippling impact.

THE TOUGH JOBS GO TO NICKEL ALLOY STEELS. Because of their outstanding strength—their high fatigue and impact resistance—producers have come to depend on nickel alloy steels for long, reliable service in the most demanding applications. Rock bit cutters, for example. Hole reamers. Drill pipe. Sucker rods. Fishing taps. In these applications, nickel alloy steels prove their dependability by providing *trouble-free* performance.

WHAT ABOUT YOUR EQUIPMENT? Do you need materials with greater strength and toughness, with greater impact resistance? Do you need materials that respond readily to heat treatment? Nickel alloy steels may prove to be your answer. For complete data, send for your copy of "The Properties of Heat Treated Wrought Nickel Alloy Steels." A postcard will do it.

TYPICAL MECHANICAL PROPERTIES
4340 nickel-chrome-moly steel

Tensile Str. 1000 psi		Yield Str. 1000 psi	
As Rolled	192	As Rolled	147
Annealed	119	Annealed	99
Hard. & Temp.[a]	150[c], 220[d]	Hard. & Temp.[a]	130[c], 200[d]
Hardness (Brinell)		**Impact Str. ft.-lb.**	
As Rolled	380	Izod. Hard.	
Annealed	240	& Temp.	73[c], 16[d]
Hard. & Temp.[a]	310[c], 445[d]		

a Properties after heat treatment are based upon oil quench and 1-in. round bars.
c Tempered at 1200° F d Tempered at 800° F

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street INCO New York 5, N. Y.

INCO NICKEL
NICKEL MAKES STEEL PERFORM BETTER LONGER

CREDIT-CARD billing staffs of more companies are adding service charges for delinquent accounts in a . . .

New Industry Trend . . .

Let Motorists Pay Some Credit Costs

• High cost of money is bringing more big marketers around to the idea that perhaps the customer should pay the interest on overdue accounts. One result: Collections are coming in faster. And, the penalty isn't alienating motorists.

THREE more petroleum marketers are making a 1.5% per month service charge on credit-card accounts that are from 60 to 90 days overdue.

Richfield Oil Corp. started assessing the charge last month on any unpaid balance more than 60 days delinquent and totaling more than $10.

DX Sunray Oil Co. this month started imposing a similar charge on bills 90 days overdue. Continental Oil Co., which had been experimenting with a service charge for a year, also instituted the system throughout its marketing territory this month.

These three thus join a growing number of oil companies which in the last 3 years have started charging customers for the privilege of being slow in paying up their bills.

How it works . . . The system of charges differs only slightly from company to company.

DX Sunray's charge works like this: When a customer has gone 60 days overdue on a credit-card billing, he will get a notice within the next 10 days. It will inform him that a charge of 1.5% of the 60-day overdue balance will be imposed if the account becomes 90 days overdue.

The customer gets a slightly greater time under Conoco's plan, which imposes the charge when the bill is 4 months overdue. Conoco sends the customer a notice when the bill is 3 months delinquent. It says if the bill is unpaid before the next billing cycle, the charge will be made.

Sunray officials say they expect to have a few complaints and are prepared to smooth out some ruffled feathers. However, they believe the results will repay them for the effort. DX Sunray Retail Sales Manager N. B. Ingram says there are at least two aims behind the action:

. . . Make the customer bear some of the extra costs of handling extended accounts.

. . . Encourage the motorist to keep his credit-card account as current as possible.

The new charge is not intended to encourage the customer to use extended credit. It really is part of a general company drive to reduce the heavy costs of credit. Similar charges are being studied for overdue farm accounts and even for joint-interest accounts in the drilling and production departments.

Money has become an expensive cost of doing business, and carrying credit accounts ties up valuable cash which could be used in other activities.

Credit-card accounts 90 days overdue are not excessive at DX Sunray and represent only a small percentage of the company's credit business; but they are sufficient to be expensive.

Conoco started the charge on an experimental basis—first in its northern region in July 1959 and in the Rocky Mountain area early this year. It was made company-wide September 1. As a result, credit officials feel they have smoothed out the rough spots in the system.

Conoco officials report they had very little customer resistance to the charge. "We know we haven't lost

customers because we have had so few complaints," says a credit official.

Conoco executives report the date from which the overdue bills are figured helps keep down complaints. That date is the time the company bills the customer—not the date of sale. Thus, the time taken for the service-station operator to send the bill to Conoco is not counted against the customer. In effect that gives him more than 4 months.

Experience of others . . . Several other oil marketers have accumulated experience with the credit charge since Atlantic Refining blazed the way in 1957.

Atlantic charges 1% after 60 days. Its notices are sent after 30 days. The charge applies to credit-card and heating-oil accounts of more than $10.

Atlantic officials claim the charge has reduced delinquency and increased income to an amount equal to 30% of the bad-debt loss on credit cards. The program gives the customer a reason to pay promptly whereas before he was interested only in paying eventually.

Union Oil Co. of California started a 1% service charge in July 1959 on accounts 60 days overdue. Union Credit Manager W. W. Workman says the company wanted to achieve three results: Induce prompt payment, cut cost of money owed by credit-card holders, and cut cost of servicing the past-due accounts.

Tidewater also has been using a 1% charge since August 1959 on both the East and West Coasts. The plan has been well received and only a few complaints have been filed.

Both Phillips Petroleum Co. and Humble Oil & Refining Co. reportedly are experimenting with a service charge on a limited basis. Pure Oil Co. has plans to institute a charge next April.

Many other major marketers, although they have not moved in that direction yet, are studying various plans. They still profess doubts about any real savings and about the legality of such a charge in some states.

One marketer reports that a bill being given consideration in Congress would require that such charges be expressed in simple interest. This would make the charge complex and expensive to his company.

One national marketer flatly said his company felt the charge was too complex and would be too expensive.

The fears expressed by these holdouts, however, run counter to the actual experience of those who have made the charge. They feel the charge is accomplishing a good purpose and eventually will find acceptance throughout the oil industry.

Oil's Political Climate

• A look at the past year shows the industry emerged in good shape from most of its problems. It could mean that oil men are making headway at long last in Washington.

Clyde La Motte
Washington Editor

THE OIL industry appears to be faring somewhat better in Washington these days.

This may be a temporary lull, like the eye of a hurricane, with more buffeting just ahead.

But a close look at developments during the past 12 months gives one reason to believe that the general climate for oil in Washington is gradually improving.

If this proves to be true, it is a highly important development for all segments of the petroleum industry. For with the Government involved in so many oil activities, a hostile attitude in governmental circles could have serious repercussions.

But that hostility, so evident on occasions in the past, hasn't shown itself to any appreciable extent recently.

In Congress . . . Congress is a good example. It took no major action affecting the industry during the past year, but it did pass some legislation useful to oil, and it turned down some legislation the industry didn't want.

Congress passed legislation revising and improving the mineral leasing law covering federal lands.

It passed a helium bill which may open the door to industry construction of plants to strip helium from natural gas, thereby giving the industry one more product to sell.

The Senate, in considering wage-hour legislation, approved an amendment which would exempt oil jobbers from the overtime provision of the act. And while this legislation died in conference, the acceptance of the jobber amendment paves the way for similar action when the next Congress takes up the issue again.

Congress also refused to act on the coal industry's pet project — a fuels policy study which many in the oil industry had opposed because they felt it was a step toward end-use controls of the nation's energy sources.

And aside from legislative action, there were other developments in Congress that cheered the oil industry.

Perhaps the most important of these was the tax study, including percentage depletion, made by the House Ways and Means Committee.

Oil industry representatives did such an effective job of explaining the provision and its use, the committee concluded there was no point in going further into the subject at this time.

In investigations . . . Oil came out all right, too, in a probe made by Rep. James Roosevelt (D.-Calif.) of charges that major firms "coerce" independent service station operators into stocking company-sponsored tires, batteries and accessories.

At the outset of this hearing, some damaging statements were made by witnesses who cited specific cases in which such coercion had occurred.

But when the majors were given their inning, they scored heavily by bringing to the hearing room some of the very operators who were supposed to have been coerced. These operators flatly denied the charges, thus greatly weakening the case against the majors.

This does not mean that Roosevelt was satisfied. In fact, it is safe to expect that his subcommittee will issue a report claiming that it developed evidence showing that company pressure on independent operators exists.

If so, there will probably be a strong minority report calling attention to the manner in which many of the charges were proved to be unfounded.

The main point to bear in mind is this: Roosevelt's hearings have done the industry no real harm.

In the FPC . . . There was some uproar earlier this year, too, over an alleged attempt by a gas pipeline company representative to "influence" members of the Federal Power Commission.

But this hearing also failed to put the industry in a bad light. If anything, it tended to spotlight the problems at the FPC and the need for doing something to help clear up the huge backlog of cases which is threatening to wreck the administrative action of that agency.

Aside from Congress, the oil industry fared all right in other areas, too.

In court . . . One of the most heartening of all was the smashing victory the industry won in Tulsa, where it clearly refuted charges of collusion in the crude and product price hikes of early 1957.

Is Improving

Rather than proving the oil industry a villain, that trial convinced many people—including many of the nation's top editorial writers—that the Justice Department had gone out of its way to try to make the industry a whipping boy.

The Justice Department, not the oil industry, lost stature in that case.

Aside from that, there were good indications that the industry is gradually becoming better understood in the Government's administrative agencies. In the long run, this can only mean f a i r e r, more intelligent oil actions by the Government.

Smarter approach? . . . What are the reasons behind this improving oil atmosphere in Washington?

No doubt there are many contributing factors.

For one thing, it may be that the industry is simply emerging from a phase of public opinion that virtually all major industries have gone through at one time or another.

But there are other, more positive, factors, too.

The industry appears to be doing a better job of telling its story in Washington, and of avoiding some of the horrible public-relations blunders it has made on occasions in the past.

And don't discount the long years of effort by oil-association officials in Washington. Gradually, these efforts are paying off.

The Washington work by association representatives is being increasingly supplemented by the establishment of more and more company offices in Washington.

This increased oil-industry representation simply means there are more people in Washington with oil knowledge and understanding to pass along to government officials and others who need it.

And it could be, too, that the reverse is true. That is, as the industry pays more and more attention to what is happening in Washington, it gets a better understanding of the Government and its problems and becomes more cooperative than it might have been otherwise.

All of this does not mean, certainly, that oil no longer faces problems in Washington, or that it will be free from attacks in Congress and from other sources.

But it does indicate that the industry apparently is m a k i n g some progress in the right direction. It may be slow and gradual, but perhaps that is the most solid progress of all.

watching WASHINGTON

Clyde La Motte

• Fuel policy proposal gets another setback . . .

One of the items which died a quiet death when Congress made a rush for the adjournment doors was the coal industry's fuel-policy proposal.

It is somewhat doubtful that the coal industry will be able to rally itself again to the all-out effort it has put behind that move during the last 18 months.

This does not mean that the coal people will not bring the subject up again next year when a new Congress convenes. It will. But some of the spark may be missing.

After all, the industry failed to win congressional approval last year. It failed again this spring, and it failed a third time during the recent bob-tailed session.

And bear in mind that the proposal it backed this year was a toned-down version of the plan the coal industry came close to moving quietly through Congress in 1959 before the oil industry made an issue of it. So, when the coal industry failed to get this compromise proposal through, it lost much of its momentum.

• Coal may switch its emphasis in Washington now . . .

What is probable now is that coal will switch its emphasis to other areas where it thinks it can make a more impressive showing.

For one thing, it is likely to continue to move aggressively into the residual fuel-oil control picture. You may be sure that each time Interior Department prepares to set import quotas for a new quarter the coal people will apply all the pressure they can to keep the quotas low.

Coal's representatives were especially pleased a short time ago when an oil publication carried an essay proclaiming that coal is calling the signals in Washington for the oil-import control program.

This was something the Washington coal representatives could send back home to show how effective they are—and perhaps draw attention away from the fact that the fuel policy drive had bogged down.

The coal boys naturally did not need to call the attention of their people to the fact that other factors were involved in Interior's decision, too, such as the controversy last spring over the rate at which some importers were bringing in their residual fuel quotas, and the specific instruction in the President's proclamation directing Interior to use 1957 residual import levels as a control goal.

Coal's future plans also call for it to get into the act if natural-gas legislation is proposed next year.

The coal strategists will ask a price for their support of any legislation to help the independent gas producer. That price will be the elimination or restriction of the use of natural gas as a boiler fuel.

• Senate ignores Eisenhower's FPC selections . . .

Congress also left town without action by the Senate on the President's appointments to the Federal Power Commission.

This means that Paul Sweeney, now serving on the commission on an interim basis, will continue only until he is replaced or reappointed by the new President next year.

As it is working out, however, the present commission appears to be getting things done faster than when it had all 5 members.

With one vacancy and with Sweeney not participating in the major cases that are about to be wrapped up, only a two-man majority is necessary to take action. Thus there are fewer delays and deadlocks than when it required three commissioners to constitute a majority.

Maybe it would speed things up if the FPC vacancies were left unfilled.

CORE DRILLING of formation outcrops in the Rockies by Atlantic Refining Co. crew provides data to help . . .

Scientists Solving Reservoir Mystery

• Atlantic's core-study project shows engineers what to expect from any blanket-type sand of marine origin. When work is completed on other types of formations, tremendous engineering break-through may be achieved.

Robert J. Enright
District Editor

MANY a tourist is puzzling this summer over the origin and meaning of regular patterns of small symmetrical holes in outcropping rock formations over widely scattered areas of the Rockies.

They'll probably never solve the mystery.

The existence of these holes and the information from them, however, may prove of immense importance to the petroleum industry's reservoir engineers.

They were put there by a research core-drilling crew working on a basic research program for Atlantic Refining Co. in an effort to solve a much greater and more crucial mystery.

The crew, now completing its second summer on the project, has been pulling large numbers of cores this year from outcrops of typical producing sands in the general area of Vernal, Utah; Rangely, Colo.; and Lander, Wyo.

Atlantic is going back to bedrock in this research program.

It is studying the heterogeneity of reservoir rocks—the differences from place to place in a rock in permeability, cementation, and porosity and what these differences mean.

From these studies, Atlantic scientists eventually hope to be able to say, for any given formation, what the payrock vagaries are and what they mean in producing the reservoir.

Early results have shown great promise. Atlantic research engineers, in fact, already feel that they can tell you what to expect in the way of permeability and other variations, for instance, in any blanket-type sand of marine origin—no matter what formation it is or where it is located.

A tremendous break-through . . . If further research should prove that they can do the same in other types of sandstone reservoirs and in the more complicated limestone-pool family, it would qualify as one of the biggest technological break-throughs in the history of the science of reservoir engineering.

As one Atlantic engineer puts it: "This is a field in which we (reservoir engineers) in the past have been working in the dark."

"Until now we have been working only with data we can get from the bore hole. And this didn't tell us anything about permeability changes in the bulk of the reservoir rock between bore holes. The reservoir engineer currently has no idea what permeability might be a few feet from the bore.

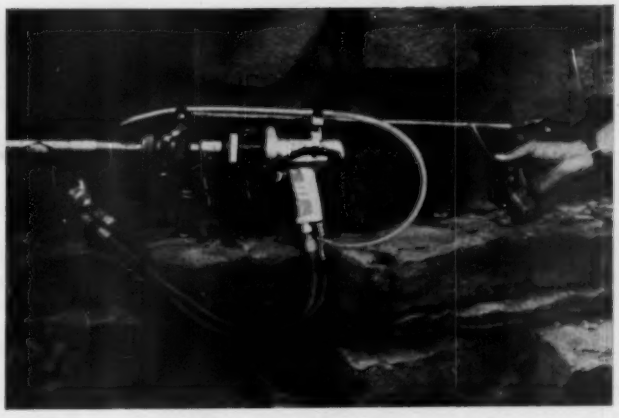
"We felt we were forced into this weak position because we couldn't pull up a reservoir and look at it—and we were content to go stumbling along on this basis without really trying to get the truth.

"Between wells there might be shale breaks, impermeable lensing, or any number of eccentricities. But the reservoir engineer doesn't know this unless the well bore should happen to penetrate these features.

"Even if this does happen, he still knows little more. He doesn't know whether a shale break, for instance, is a continuous feature over the reservoir, whether it is broken only in occasional spots, whether it exists just in the area of the well bore, or whether perhaps it might be one of many small shaly areas in the formation."

The practical importance . . . It is of tremendous importance to the engineer that he should know these things about his reservoir.

Unless he does, he cannot intelligently design a miscible drive. "And



CORE DRILL in closeup. It uses a 1-in. diamond core bit on the end of a 1-ft. core barrel. A small exhaust nozzle blows the dust from the coring operation away from the operator's face. Drill is powered by a Jeep-mounted air compressor.

CORING TECHNIQUE developed by Atlantic being used to take a sample of Mesa Verde sandstone from this outcrop near Rangely, Colo. Man on ladder guides core drill. Companion on ground applies force to drill with a nylon rope and block and tackle. Average time for taking a core is about 15 min.

many of the miscible-drive disappointments to date have been due to lack of advance knowledge of sharp permeability fluctuations over the reservoir," according to Chuck Hutchinson, reservoir mechanics group supervisor who is responsible for the project for Atlantic.

If the planning engineers knew the erratic permeability was there, he says, they could design the project using a larger L.P.G. slug to compensate for it. Or they might not have started a miscible drive at all, figuring it to be impractical and adopting a water flood instead.

It is vital for the engineer planning a miscible drive to know enough about his reservoir to predict accurately what will happen in the way of gravity segregation, cross flow between streaks of differing permeability, in channeling and bypassing, and in slug depletion. If successful, the Atlantic project will give him this knowledge.

But better planning of miscible projects would not be the only fruit.

Industry engineers could likewise decide upon and design water floods with an accuracy never before possible. They could produce reservoirs with gas caps or natural water drives much more intelligently so as to recover more oil. In many reservoirs, knowing the eccentricities of the pay could guide an operator in developing the fluid differently, so as to come up with the best possible pattern for an injection project later.

This would be especially true of those pools where permeability is directional. In the Burbank pool in Oklahoma, for instance, permeability in one direction is much different than in another.

If Atlantic's early successes with marine-type, blanket sands are followed with similar victories over other types of sand and lime reservoirs, this break-through is in reach.

How it's done . . . Atlantic's core party devotes full time to the research project through the summer months to take advantage of the season's favorable weather in the Rockies—a region wealthy in outcrops of a great many producing formations.

Equipment consists essentially of a truck loaded with camping and core-testing equipment and a Jeep mounting an air compressor to power the core drill.

Coring equipment for the project was designed and fabricated by Atlantic research personnel in Dallas.

When the crew tackles an outcrop, its members use a stud gun to anchor pins in the rock. A ladder for the drill operator is secured to the pins, then a block and tackle arrangement added. This permits a man on the ground to apply the needed force to drill by pulling on a nylon rope while the man on the ladder merely guides the drill.

Drill time for a 1-ft. long, 1-in. diameter core varies widely—with the type of rock being cored—from only about a minute to perhaps as much as an hour on the very hard formations.

The crew saturates some areas of the rock with holes every 6 inches, tracing the lensing, shale streaks, and other non-uniformities. When it gets enough cores to evaluate the permeability differences in all the lenses, it moves on to another outcrop.

Cores are initially examined on the site via a compact portable laboratory in the back of the truck. Equipment can measure permeability, grain size, and other rock characteristics.

Pilot run in Dallas area . . . First field work on the project was carried out in the Dallas area in the early summer of 1959.

There, near Arlington, Tex., the

crew cored the Woodbine zones conveniently exposed by the Fort Worth & Denver Western Railroad in cuts along its line from Houston to Denver. Studies of Woodbine and Paluxy sands were made in other similar cuts near Denton, Tex.

Most of the summer, however, was spent coring the Pictured Cliffs, Gallup, Dakota, and other pays in the Four Corners area. It was this work which Atlantic engineers say enables them tentatively to classify the kind and amount of heterogeneity of blanket-type marine sands.

This year the company is working also the channel-fill and offshore-bar type reservoirs, studying cores of typical producing horizons pulled from outcrops in northern Utah, northwestern Colorado, and northern Wyoming.

Crew members include: Theo Polasek, research engineer in charge of the crew; Jim Conley, research engineer; Charles Dodge, professor of geology at Arlington State University; and Wayne Maxwell, student helper. In direct charge of the project at Atlantic's Dallas research laboratory is Phil Braun, reservoir-mechanics group leader.

Help wanted . . . Atlantic feels that it has gone far enough with the project now to prove its merit to the industry generally. And it hopes other companies—the more the better—will take part.

The magnitude of the program is such that it might take one company "almost a lifetime" to complete it. But Atlantic scientists think cooperation of several of the larger firms could cut completion time down to only a few years.

The company still has a long way to go in the study of just the sandstone reservoir types. Along with the marine-origin blanket sands, the program should cover other sand-reservoir types such as the offshore bars, channel fills, pinchouts or shaleouts, and pools formed by deltaic and turbidity-current action.

The limestone group is more complicated yet.

As Hutchinson puts it: "The project is a little rich for our blood. The burden in costs and personnel is great for one company to carry alone. We want others to help out."

One other major company already has started a complementary program. And another has expressed interest in possibly joining the project.

Atlantic is hoping that a full-fledged paper it will present on the promising results of the program so far at the coming fall meeting of the Society of Petroleum Engineers in Denver October 2-5 will help enlist some more support.

Decontrol Studied for Imports

. . . of asphaltic crude. OCDM decision for exemption of heavy oil from quotas, however, still may be months away.

THE OFFICE of Civil and Defense Mobilization is moving methodically toward a decision whether to exempt asphaltic crudes from oil-import controls.

It has already received an outpouring of opinions from the oil industry and related industries.

It is now going through a formal 20-day period in which it will receive rebuttals from all parties concerned. It is also receiving—or will receive—opinions from various government departments, including Commerce, Interior, Defense, and State.

When this procedure is finally completed, OCDM will then set about making up its own mind. Obviously, a decision is still weeks or months away.

OCDM's involvement began last June when four oil companies—Cities Service Co., Atlantic Refining Co., Standard Oil Co. (Ind.) and Standard Oil Co. of California proposed a decontrol plan.

These four suggested that the asphaltic content of crude used in making asphalt be exempt from controls and that the total of such crude brought in be deducted from the overall import totals permitted.

This, the companies felt, would permit the import of the needed amounts of asphaltic crudes without increasing the total of crude imports.

The companies pointed out that there is not enough domestic crude with a high asphaltic content to make it feasible to supply the amount of asphalt necessary for the highway program and other domestic asphalt requirements.

Other side . . . OCDM, however, has received some stout protests to one phase or another of the proposed plan.

Leonard Refineries, for instance, maintained that the suggested approach would give a "favored few" a lower cost asphalt than would be generally available to other refiners.

Socony Mobil Oil Co. said it favors the exemption of the asphaltic content from mandatory controls but feels that this should not be deducted from other crude quotas.

Socony cited figures to show that the reduction of total imports by the amount of asphaltic crudes imported would, in effect, mean a 10% reduction for each crude oil quota holder in Districts 1-4.

"Obviously, such a result is unfair and discriminatory when applied to the great majority of quota holders," Socony said.

Like Leonard, Socony obviously feels that a few would benefit, but a majority would suffer.

Socony also pointed out that it would be difficult for the Government accurately to estimate the amount of asphaltic crude that would be imported during a given allocation period. This could lead to complicated quota readjustments, the company said.

Socony proposed that the asphaltic content be exempt from the control program entirely. This, then, would leave total crude import quotas unchanged.

Support from users . . . Socony justifies this by pointing to the growing need for asphalt in this country.

Generally speaking, users of asphalt tend to agree with the Socony approach because it would make a greater supply of asphalt available.

But some companies and groups stoutly oppose any move that would increase the total quantity of crude imports. They figure this would be the

PROCESSING

A petrochemical research laboratory will be built by Rexall Chemical Co. and El Paso Natural Gas Products Co. on a 20-acre tract near Paramus, N. J. The two companies are planning an integrated plant at Odessa, Tex., to produce olefins, polyolefins, and chemicals.

Murray A. Shutz, San Francisco refiner, plans to open the former bankrupt refinery of Queen City Oil & Refining Co. at Dickinson, N. D., next April as the Great Plains refinery. Litwin Engineering, Wichita, has contract for revamping and construction work which will expand capacity from 2,500 to 4,500 bbl. daily. Schutz revamped a small refinery in Wainwright, Canada, in a similar operation 8 years ago.

A $4 million natural-gas processing plant will be built at McGregor, N. D., by Oil-Chem Corp. of Dallas. The plant will have initial capacity of 20

first step toward diluting the effect of the control program.

They insist that asphaltic crudes should continue to be a part of the over-all import quotas so that if a company increases asphaltic crude imports it will have just that much less of other crudes to import under its quota. Also this group argues that the domestic oil industry can supply enough asphaltic crudes.

Canadian Gas Hits Midwest

CANADIAN natural gas has begun moving into the U. S. Midwest. Trans-Canada Pipe Lines Ltd. has completed construction of a 51-mile connection between its Alberta-Montreal line and the system being built in Minnesota and Wisconsin by Midwestern Gas Transmission.

The 30-in. connecting link takes off from the main Trans-Canada line south of Winnipeg and ties in with the Midwestern Gas Transmission line near Emerson, Man. The Midwestern system will carry the gas to Marshfield, Wis., where it connects with the Michigan Wisconsin Pipe Line system.

Branches of the Midwestern Gas system will serve two cities in North Dakota, Grand Forks and Fargo. When the Midwestern line is completed this fall it will take 204 million cubic feet per day from Canada for distribution in the Midwest. The first gas being received by Midwestern is being used for purging and testing completed sections.

New Rubber License Offered

. . . by Goodrich-Gulf after winning patent rights from Government over synthetic-natural rubber development.

GOODRICH-GULF Chemicals, Inc., is now ready to open negotiations with anyone desiring to use its process to make a synthetic rubber which has all the qualities and properties of natural tree rubber.

The company reached this stage after a compromise consent decree was approved by a federal judge to end a year's long controversy over whether the company or the Government holds rights to the patents.

The Government's position was that the process was developed while the rubber facilities were being operated by private companies under government ownership.

The company maintained that it developed the process independently.

Under the consent decree, Goodrich-Gulf won the right to make the process available to others and will be permitted to collect a royalty of 2½% of the sales price of the rubber produced. An initial cash payment and other conditions are also involved.

Although synthetic rubber has already captured much of the U. S. rubber market, there has continued to be a considerable demand for natural rubber, particularly for the manufacture of heavy-duty truck tires.

It is in such uses that the new synthetic rubber is expected to be employed.

One obvious advantage of having the new type of rubber is that this nation would not have to depend on foreign supplies in an emergency.

Aside from an emergency, it is expected that the new rubber will move gradually into the natural-rubber market, replacing it when tree rubber prices rise and losing some of the market when those prices drop.

A significant factor, at least for the oil industry, is that the development promises to increase the demand for oil as a raw material for rubber manufacture.

The new product can be made in several ways, one of which is the polymerization of isoprene, a hydrocarbon that can be converted from the C_6 stream of a refinery.

There are other processes in various stages of development that are somewhat similar to the one being offered by Goodrich-Gulf Chemicals. One of the basic differences, however, is in the type of catalyst used.

Plans have already been announced for plant construction by several companies using one or another of these processes, and others are known to be interested (OGJ, May 16, p. 99).

BRIEFS . . .

million cubic feet of gas per day, and will be designed to increase capacity to 30 million cubic feet. Completion is scheduled for next spring.

A butanols plant to produce n-butanol and iso-butanol will be constructed by Dow Badische Chemical Co., at Freeport, Tex. Completion is scheduled for early 1961. Dow Badische is jointly owned by Dow Chemical and BASF, Overzee, N.V.

A new gasoline testing laboratory is being built at Long Beach, Calif., by Ethyl Corp. The laboratory is to be in operation early next year.

Gas-treating units are manufactured by a new subsidiary of Kern County Land Co., San Francisco. The new corporation is Gas Processors, Inc., which designs and produces portable, skid-mounted processing units for field use. Forerunner of the company was Gas Processing, Inc.

A new engine-testing laboratory will be built by Socony Mobil Oil Co. at its Paulsboro, N. J., research laboratories. The facility will accommodate 20 test engines, nearly doubling the company's engine-testing capacity. The expansion is part of Socony Mobil's program to develop fuels and lubricants for engines of the future.

Styrene capacity at Shell Chemical's Torrance, Calif., plant is being expanded from 15 to 17.5 million pounds a month. Ehrhardt & Associates have the contract for the expansion.

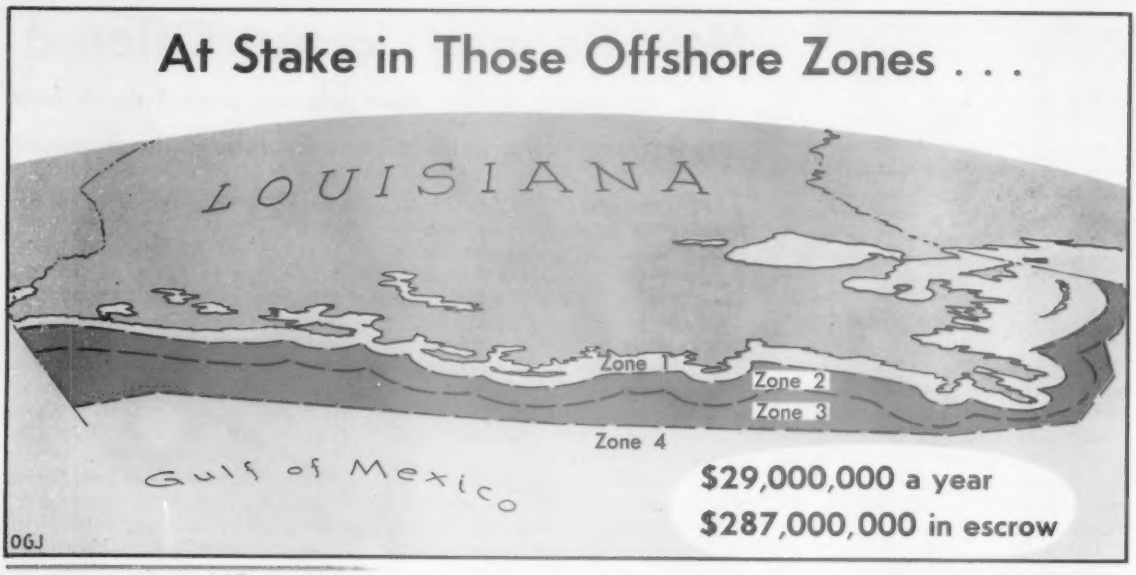
Phthalic anhydride and phthalate ester plasticizer plants will be constructed by Monsanto Chemical Co. on a multi-product plant site in Gloucester County, New Jersey. The newly-acquired site contains 650 acres adjacent to the Delaware River. Completion of the units is scheduled for early 1962.

Benzene capacity at the Baton Rouge refinery of Esso Standard Division of the Humble Oil & Refining Co. will be increased from 9 million gallons to 24 million gallons a year. Completion is expected by December.

Also for Refiners . . .

IN THE NEWS: More marketers begin to make a service charge on delinquent credit-card accounts (p. 63) . . . OCDM is studying plans to exempt asphaltic crudes from imports controls (p. 68) . . . Goodrich-Gulf offers new rubber license after winning patent rights from Government (p. 69) . . . Way now cleared for Government to deal with private oil companies to build helium-processing plants (p. 82).

PLUS THESE TECHNICAL REPORTS: Reducing operating costs of MEA gas treaters (p. 118) . . . New plastic packing for trickling filters (p. 122).



Big Money Rides on Louisiana's Coastline

• Fixing the boundary won't settle much until the shoreline is mapped. And a hundred feet here could make a big difference when the escrow money is split.

LOUISIANA'S stake in the still-unsettled tidelands boundary dispute is enormous.

Even if the Supreme Court sticks to its 3-mile ruling for the Louisiana seaward boundary, subsequent decisions on the exact location of that boundary will determine whether the state or federal government gets millions of dollars now held in escrow.

A dollars-and-cents explanation of the importance of the boundary was offered last week in New Orleans at the annual meeting of the Louisiana-Arkansas Division of the Mid-Continent Oil and Gas Association.

J. W. Pittman, production manager for Shell Oil Co. in New Orleans, presented the figures.

Disputed area . . . Zones 2 and 3 in offshore Louisiana contain the valuable acreage still in dispute between Louisiana and the U. S. Government.

The two zones, according to Pittman, contain 49 oil and gas fields, plus portions of 12 others located in Zones 1 and 2.

Zones 2 and 3 have 935 wells which produce 108,600 bbl. of crude and condensate daily and 653 million cubic feet of gas daily. Royalty for this production amounts to $26.4 million annually, plus another $2.6 million in rentals.

On July 1, the escrow account had impounded $287,859,700 from royalties, rentals, and bonuses in the two zones. The escrow money represents

Demand Grows Faster Than Reserves

A LEADING oil economist last week pointed to one of the industry's real paradoxes—and offered some advice on how to handle it.

Richard J. Gonzalez, a director of Humble Oil & Refining Co., said that productive capacity has increased faster than demand in recent years but that estimated proved reserves in the United States have not increased as rapidly as demand.

These "divergent trends" mean that the industry must continue to encourage development of new domestic reserves but also must encourage operators to slow down on premature development of this additional capacity.

Gonzalez gave his views last week at the thirty-eighth annual meeting of the Louisiana-Arkansas division of the Mid-Continent Oil and Gas Association in session in New Orleans.

The economist said the industry is moving in the direction he suggests because statistics this year show that wildcat completions are up slightly over 1959, while development drilling is down by a substantial amount.

Operators have been slow, however, to recognize a drop in the long-term growth rate for the industry, Gonzalez said.

The average operating rate for the domestic producing industry this year probably will be about 70%, Gonzalez said, and the current margin between production of all petroleum liquids and maximum efficient capacity is probably in the range of 3 million to 3.5 million barrels daily.

About half this spare capacity is needed as an emergency reserve for national security, Gonzalez believes.

Richard J. Gonzalez
. . . Urges restraint in development.

the immediate funds at stake, while additional money in years to come will amount perhaps to hundreds of millions more.

Regardless of future court decisions, it is generally agreed that Zone 1, nearest shore, belongs to Louisiana, and Zone 4, farthest offshore, belongs to the U. S.

What could happen . . . Barring a switch in the court's decision upon rehearing, Pittman sees two possible solutions to the tidelands boundary case.

. . . The state could gain virtually all of Zone 2 and most of Zone 3, if the Supreme Court accepts Louisiana's claim that its coastline lies along a line established by the Coast Guard in 1895.

. . . The state would be limited to 3 miles (or 3 leagues if the decision is altered) seaward of land-water contact. This would present a vastly complicated problem of determining just where the shoreline is located.

Under the first possibility, Louisiana relies on a legislative act of 1954 stating that the coast line is the same as the 65-year-old Coast Guard line, established by the location of fixed aids to navigation.

Louisiana would get almost all the $287.8 million in impounded escrow money, and it would get another $18,250,000 annually in royalty.

The survey . . . The second possibility was recognized several years ago by the state and federal governments, and they established a joint committee to place the actual shoreline.

The Chapman line was established as the shoreline by the Government for administrative purposes—fixing the zones—and has been accepted by Louisiana only for such purposes.

Pittman says the location of the shoreline will be a "keenly contested matter" because its placement will involve millions of dollars in oil and gas revenues.

The price tag on ½-mile . . . Zone 1 consists of the area 3 geographic miles seaward of the Chapman line.

Pittman figures that if the shore line is determined to lie only ½ mile seaward from the present Chapman line along its entire length, the royalty interest in 77 wells in 12 fields would pass from the United States to Louisiana—and this would mean a gain of $1,650,000 annually in royalties for Louisiana.

If, on the other hand, the shore line were moved ½ mile inward from the Chapman line, the U. S. would gain $1.4 million annually from the fields affected.

First-Half Profits: Up Slightly

FIRST-HALF profits in the oil industry were only a hair better than earnings for the same period last year, a detailed study of 41 oil companies by a New York brokerage firm shows.

Total net income of the 41 companies was $1,367,533,000, an increase of 1.3% over the $1,350,357,000 earned in 1959.

Interesting aspect of the first-half profits picture was the quarterly breakdown. A Carl H. Pforzheimer & Co. study shows that industry earnings of the second quarter averaged 3.1% higher than for the same 1959 quarter while first quarter of 1960 showed a slight decline.

Reasons for the better second-quarter performance were a 3.1% increase in demand and higher petroleum product prices.

Individual company performances varied, naturally, but Pforzheimer statisticians noted these trends:

The international companies all had higher first-half earnings due to heavier jumps in petroleum demand abroad than at home.

The producing companies also showed better than average earnings while those heavily engaged in refining had a less favorable showing. This reflected the steady crude prices during the period and the unfavorable products prices.

FIRST-HALF OIL-COMPANY EARNINGS

	1960 Net Income	1959 Net Income	% change
Amerada Petroleum	$12,058,687	$11,661,857	3.4
Anderson-Prichard	2,166,692	3,044,098	−28.8
Argo Oil Corp.	2,443,160	2,630,308	− 7.1
Ashland Oil & Ref.*	6,302,424	7,300,188	−13.7
Atlantic Refining	16,917,000	17,356,000	− 2.5
Champlin Oil & Ref.	3,361,675	4,286,928	−21.6
Cities Service Co.	18,672,860	18,904,894	− 1.2
Continental Oil Co.	28,493,000	29,160,000	− 1.3
Getty Oil Co.	4,490,582	4,295,823	4.5
Gulf Oil Corp.	156,095,967	141,814,158	10.1
Honolulu Oil Corp.	5,614,737	6,443,792	−12.9
Louisiana Land & Expl.	11,061,787	9,168,660	20.6
Midwest Oil Corp.	3,398,781	3,471,453	− 2.1
Monterey Oil Co.*	1,445,087	1,886,956	−23.4
Ohio Oil Co.	17,732,709	18,556,445	− 4.4
Phillips Petroleum	51,747,822	53,208,794	− 2.7
Plymouth Oil Co.	43,486	2,184,378	−80.1
Pure Oil Co.	13,756,000	13,148,000	4.6
Quaker State Oil	765,480	1,003,978	−23.8
Richfield Oil Corp.	13,987,894	10,694,790	30.8
Shamrock Oil & Gas*	4,459,813	4,786,416	− 6.8
Shell Oil Co.	69,312,041	69,186,731	0.2
Signal Oil & Gas	7,603,813	8,658,272	−12.2
Sinclair Oil Corp.	21,661,951	26,599,689	−18.6
Skelly Oil Co.	11,089,524	13,956,566	−20.5
Socony Mobil Oil	83,400,000	77,100,000	8.2
South Penn Oil	1,897,581	1,796,106	5.6
S. O. California	128,589,000	118,153,000	8.8
S. O. Indiana	64,887,000	78,851,000	−17.7
S. O. Kentucky	6,958,000	6,743,000	3.2
S. O. New Jersey	315,000,000	315,000,000	
S. O. Ohio	10,956,032	9,880,800	10.9
Sun Oil Co.	20,031,795	21,974,015	− 8.8
Sunray Mid-Continent	18,742,708	20,948,203	−10.5
Superior Oil of Cal.*	15,627,924	14,158,859	10.4
Texaco Inc.	177,342,169	164,961,377	7.5
Texas Gulf Producing	2,414,005	2,092,112	15.4
Texas Pacific C. & O.	3,967,628	3,641,534	9.0
Tidewater Oil Co.	18,277,000	18,633,000	− 1.9
TXL Oil Corp.	1,389,913	2,242,695	−38.0
Union Oil of Calif.	13,369,763	10,771,823	24.1
Total	$1,367,533,490	$1,350,356,698	1.3

*Fiscal quarter corresponding to calendar quarter.

PRESS CONFERENCE at Idlewild airport found Ira Cram, left, W. W. Keeler, and George T. Piercy telling reporters . . .

How Three Oil Men Size Up Russia

• It's behind the U. S. in oil technology, but it's as good as it needs to be now. Expansion is the rule in refining and chemicals. There's no lack of places to drill, and the Reds will probably top their production goals. The unanswered question: What will they do with their surplus?

THE FIRST American oil men to take a good postwar look at the Soviet oil industry came back with a real and profound respect for what the Russians are doing now and with misgivings about the future.

Bone weary after a full month spent in sampling the sprawling industry, a trio of U. S. oil executives landed at New York with some definite ideas—and several unanswered questions—about Russian achievements and plans.

They are firmly convinced that the Soviet Union will not only achieve its 7-year plan of 4,800,000 bbl. of crude oil daily by 1965, but may well surpass it.

Still unanswered is just exactly what will be done with this expanded oil industry.

The three Americans, the first returning group of an eight-man team that went to Russia August 2 under State Department-API auspices, included W. W. Keeler, executive vice president of Phillips Petroleum Co.; Ira H. Cram, senior vice president of Continental Oil Co.; and George T. Piercy, head of the petroleum-economics department, Standard Oil Co. (N. J.).

The rest of the party consisted of George S. Dunham, a director of Socony Mobil Oil Co., Inc.; Whitney M. Elias, vice president of Pan American Petroleum Corp.; George Getty, president of Tidewater Oil Co.; Neil J. Smith, vice president, Chevron Oil Co.; and Dr. Neyes D. Smith, Jr., vice president of Shell Development Co.

Keeler, Cram, and Piercy agreed that in spite of more than 6,000 miles of travel inside Russia, they had only sampled the Soviet oil industry.

"We've been on the go and kept busy all day every day for the past month," Keeler said wearily. "When we weren't looking over some oil installation or research lab we were being exposed to a 'Palace of Culture' somewhere."

"Actually, all of us are going to have to sit down and try to assess exactly what we did learn about the Russian industry. At this point we have been so busy trying to assimilate information, we aren't too sure what our conclusions are."

Nonetheless, a number of definite impressions were formed by the group. Here are some of them:

. . . **The Russian goal for 1965** in oil production will certainly be met and perhaps will be topped.

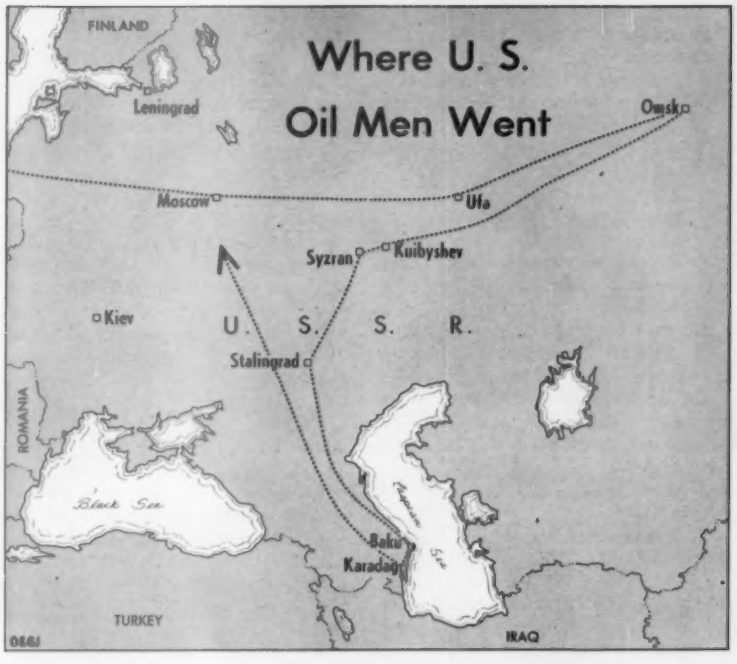
When the 7-year plan for the industry went into effect last year, the Russians said they wanted to increase oil production from 129 million tons a year (2,580,000 bbl. daily) to 240 million tons a year (4,800,000 bbl. daily) by 1965.

The first half of 1960, the Russians produced oil at an average rate of 2,850,000 bbl. daily.

. . . **Refining and chemical expansion** is going on everywhere to keep up with rising production.

. . . **Russian technology,** except in drilling, did not impress the visiting Americans. They did not see anything new or startling, but they caution that this is not too important because of the difference between the nature of the demand and the ultimate goals in the U. S. and in Russia.

The important point, in their opinion, is that Russian technology is as



Next: Russians Here

NOW it's the Russians' turn to look at the U. S. industry, and their delegation is due to arrive for a month's reciprocal tour starting October 10-12.

Details are being worked out by the API, co-sponsor with the State Department of the exchanges, and members of the U. S. party just returned from Russia.

The Americans were given a carefully guided tour; the Russians can expect to see equivalent installations—and no more, tour planners indicate.

The Soviet delegation will have a heavy technical flavor. There will be eight technical men, such as refinery chief engineers, leading research scientists, etc., revealing their intention to seek out any American know-how they don't already have.

By contrast, the American delegation was largely executive, although some had technical backgrounds.

good as it needs to be to accomplish its purpose.

. . . **Russian technicians** are expert and well trained. The tourists found that Russian engineers know their jobs well. However, they have little interest or knowledge concerning any other phase of the industry or even of closely related operations.

1. What they saw

Besides visiting Moscow, Leningrad, and Stalingrad, the group toured four fields, four refineries, a number of research institutes, a gasoline plant, and a water-flood operation.

They obtained photographs of representative equipment which will give the American industry an idea of Russian progress. Here's what they saw:

In drilling-production . . . The Americans were taken to the old Baku area, described as "a forest of derricks—like Long Beach," and to three oil centers in the booming Second Baku region—Kuibyshev and Syzran on the Volga River, and Ufa in the western Urals.

The "offshore" field which they were shown in the old Baku area was an onshore field which slopped over into the Caspian Sea. The field was served by a maze of walkways and roadways, constructed over the water.

The fields on the tour were relatively shallow, with the exception of Karadag, in Baku, which was 10,000 to 12,000 ft. The group found the Russians to be using the turbodrill—their invention—on a large scale. "We were quite impressed with it," Cram reported.

The Russians said they had drilled one hole of about 13,500 ft. with the turbodrill. They have also been using an electric drill, which they say is suitable for holes 6,000 ft. and deeper.

How many wells are the Russians drilling?

"All we saw was a rig or two running in each field," Cram said. "But we don't know how much drilling they are doing."

In exploration . . . The Russians do not lack prime structures to drill, and this is one of the reasons that they are having little trouble expanding production.

"The Russians finally woke up to the fact that they had to drill some wildcat wells to find oil," Cram said.

"Because they have been drilling good structures known and mapped for years, they have had high success ratios in their so-called wildcatting programs. But the way they report it, they are drilling 50% wildcats. A stepout well on a known structure is, to them, a wildcat."

In manufacturing . . . Expansion is the key word in the refining and chemical industries, as it is in production.

"There was substantial construction under way at every plant we visited," Keeler said. "And, incidentally, it was the same everywhere we went, buildings of all kinds going up. They say that in Moscow, an eight-story flat is completed every 2 hours."

It is difficult to compare their refineries with American refineries because they are geared to yield the maximum diesel and fuel oil and the minimum high-octane gasoline.

In marketing . . . "We didn't see anything like a modern service station," Keeler said.

"We saw six gasoline 'outlets' in 6,000 miles. An 'outlet' has an old beat-up pump with the hose and nozzle wired to the car to keep it from falling off during the lengthy filling period."

There seemed to be few passenger cars (as a matter of policy of the Soviet Government), and good highways were limited to the vicinities of major cities.

2. What they learned

The American oil men first said the Russians were several years behind U. S. in most of their technology, but made important qualifications to this statement.

In manufacturing . . . The Russians have virtually none of the modern processes installed in American refineries the past 10 years.

But this fact can be misleading.

"When we say the Russians are 'behind' we mean in the status of the art of operations," Keeler explained. "But they have very capable people in refining and production.

"With respect to refining, their problem is entirely different from ours. We are pushing maximum yields of high-octane gasoline. In Russia the

problem is a shortage of diesel fuel. They have a lot of trucks but very few passenger cars.

"Gasoline is almost a surplus commodity. They need maximum fuel oil and diesel yields.

"Since their problem is entirely different, it is not fair to say their technology is behind. What if they don't have a lot of the newer refining processes? They don't need them for their present purposes."

Their use of manpower is not as efficient as in the U. S. industry, Piercy said, but pointed out they are licking their problems as they need to.

He found great pressure for automation in refineries to improve efficiency and free personnel to run expanded facilities. Part of the explanation for the large numbers of workers was that they were being trained for new plants.

In exploration, production . . . Cram said the group learned little of Russian exploration thinking, inasmuch as the tour emphasized production and refining.

Secondary-recovery methods were found to be behind the U. S. Or at least there were no apparent attempts at such techniques as miscible-phase displacement, which would be useful in many old fields, or fire flooding to produce viscous oils.

But the importance of these facts was discounted.

"Assume that their technology is 10 to 15 years behind in exploration and production," Cram said. "That means absolutely nothing. We could take a 1945 or 1950 seismograph to Russia and find a lot of oil and produce it easily.

"If you are drilling on long-known structures where oil is easy to find, at no more than 8,000 to 10,000 ft., and all you have to do to develop enough productive capacity is to keep stepping out, their technology is as good as it needs to be.

"How far are they behind? We quit that mental exercise very early in the tour."

As far as personnel was concerned, Cram said he was told that Russia, with less than half the producing rate of the U. S., had two or three times as many petroleum engineers in the field. They appeared to be well trained and competent.

In borrowed technology . . . The American oil men found some strangely familiar sights in the plants and fields.

At the end of World War II, one member of the eight-man group—Dunham—went to Russia to try to sell Socony's Thermofor catalytic cracking process to the Red oil scientists. He thought he was a failure.

Fifteen years later, this group saw from a distance a dozen cracking units with remarkably similar lines. If they had not known better, they would have sworn they were seeing Thermofors.

Copies of well-known pumping units and other equipment also were observed.

3. What they didn't learn

What the Americans didn't learn was far more interesting than what they did learn on the tour.

Here's what they didn't find out:

. . . Russia's intentions as to increasing exports and future pricing policies in the world market—questions which are being asked with increasing frequency in international, and domestic, oil circles.

. . . How much oil in the ground Russia has.

. . . Costs of finding, producing, and processing oil.

About Russia's intentions . . . Russia's rise as an exporter of crude and products has come at a time when a vexing world surplus has developed.

In the midst of this surplus Russia has been able to increase exports from 360,000 bbl. daily in 1958 to more than 500,000 bbl. daily last year, taking advantage of a tanker surplus to obtain low charter rates.

While the share of the world market is relatively small, the rate of increase is disturbing. Russia is not only taking markets that historically have belonged to free-world producing nations; it is making deals at prices well below the world market.

Russian price cutting was considered a factor in the recent reduction of posted prices in the Middle East.

Faced with a Russian productive capacity that is obviously growing, and growing rapidly, western oil men have a natural anxiety as to what further mischief the Soviets may be planning.

"We couldn't get anything about foreign trade goals, outside of their own sphere," Piercy said last week.

How much oil will be available for export in the free-world market hinges in large part on policy decisions as to satellite exports and domestic fuel selection.

Keeler observed that Russia's domestic demand is a question mark. "They have terrific latent demand," he said. "They have several markets in which they can push petroleum, if they so desire. They have been converting coal-fired steam locomotives to diesel, and they are short of diesel.

"They expect to convert power plants from low-grade coal to fuel oil. The demand in these areas is being supplied by lower-grade (more expensive) fuels."

So the industrial growth in Russia and the satellites should be able to absorb much of Russia's planned increase in output, although an increasing exportable surplus is indicated.

"Russia could be a substantial economic problem in the oil business," Keeler warns. "She certainly has the productive capacity and the potential to do more than she is doing."

About reserves . . . An attempt was made to get some idea of Russian reserves, but it was a complete failure.

"We flirted with that but didn't find out anything," Cram said. No one in the group was able to make even an educated guess.

About costs . . . Costs proved to be as baffling as reserves, even though a few isolated figures were released.

A Soviet official was quoted as saying, "We won't talk about costs. That's a trade secret." The Americans were turned down at the top when they asked for finding, producing, and processing costs.

"Two refineries furnished some cost figures," Piercy reported, but he questioned whether they weren't arbitrary interdepartmental figures. "Their pricing system is rigged to promote or stymie consumption, as someone on top so decides; it is not based on economics. They admitted as much to us," he said.

Their method of cost allocation would drive an American accountant to distraction. Housing, "Palaces of Culture," and other social services to workers are paid for by the plants which employ them.

In a plant, each unit has a quota. If the quota is exceeded, workers on the unit will receive a bonus, which is not charged directly to the price of the product. Hence the difficulty of arriving at any valid cost figures.

4. Value of the trip

If the American oil men saw nothing they could put to work in the U. S., what was the value of the strenuous, carefully guided tour?

All felt it was eminently worth while, for these reasons:

"Before we made the trip, we had no feel as to just where they did stand. We had no idea of the extent of their operations quantitatively. Qualitatively, we knew they were behind us. Our impression was supported by the fact we learned nothing new in the way of technology or operating practices.

"But the trip was worth while because it answered the questions about where they stood in the status of the art, and the tremendous potential and the extent of their operations."

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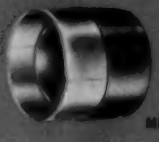

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Plastic-foam pillow was one of the products made from Sinclair petrochemicals that stockholders saw.

All the Talk's about Sinclair Petrochemicals

Sinclair's continuing petrochemical progress was a prime topic of conversation at the Company's annual meeting of stockholders this year.

- The volume of chemical sales in 1959 doubled that of the previous year, and the 1960 volume to date is even better.
- Sinclair is now the largest producer of paraxylene, the basic raw material for polyester fibers used in the popular wash-and-wear fabrics.
- Sales of the plastic raw material, high purity propylene, first made in this country by Sinclair, are at an all-time high.
- In a joint undertaking with Koppers Company, Inc., a major plant is being built at Houston, Texas to produce styrene monomer, a synthetic rubber and plastics raw material.

Stockholders were told that this rapidly expanding field is "an excellent route for product diversification, and an important new source of profits".

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Texans Fighting Threat of Heavy New Taxes

• Proposed program of levies would cripple the industry which already pays 55% of all state taxes. Oil leaders urge broader base for new income to meet Texas' deficit.

TEXAS oil and gas producers have gone on the attack against further state taxation. They declare flatly new taxes threaten to kill the state's golden goose—the oil and gas industry.

The Texas Mid-Continent Oil and Gas Association made this clear in advising the state's finance advisory commission. This group is studying what to do about a growing budget deficit. It heard the oil spokesmen claim more taxes of any kind will only accelerate an already sharp decline in the oil industry's economic health.

The commission in its first report said the state will need $46,000,000 a year in new revenue to liquidate the deficit and continue present state services even if the severance-beneficiary tax on gas is eventually held constitutional. If the tax is stricken, the state will need $62,000,000 a year.

The money needs are even greater if the state is to finance and implement past legislation authorizing state medical aid and higher pay for teachers. To handle these programs too, the commission said, the state will need a total of either $93,000,000 or $108,000,000 in new revenue yearly—depending again upon whether the severance tax stands. A district court already has held it unconstitutional.

Several proposals have been presented to the commission which would raise present taxes affecting oil and gas or levy new ones. These proposals furnished the catalyst for a 54-page analysis handed the commission earlier this month by TMOGA.

Burden too heavy . . . The oil and gas industry, and its principal product, gasoline, account for more than 55% of the tax revenue of this state.

"We believe this is more than our fair share of the Texas tax burden. And we have difficulty understanding the reasons for tax proposals which would increase this burden at every turn—proposals for an increase in production taxes on oil and gas, the imposition of a gas-processing tax, an increase in the franchise tax, and the imposition of a gas-pipeline tax," the TMOGA report said.

The report pointed out that the Texas oil and gas industry's employment rolls "have shrunk by 21,200 jobs since 1957, that Texas produced less oil in 1959 than in 1951 though U. S. production increased, and that oil prices in the U. S. declined in 1958 and 1959 and may decline further in 1960."

Furthermore, it said Texas share of the natural-gas market declined from 51% of the U. S. market in 1953 to only 46% in 1959.

The industry's total state and local tax bill last year ran more than $360,000,000, TMOGA said—equivalent to 38% of its drilling budget or one-third of its payroll. Operators paid $210,000,000 in state taxes alone. "And oil and gas taxes accounted for 49% of all state revenues collected for public education."

New proposals hit . . . The TMOGA analysis took dead aim at these new proposals for further increasing the state industry's tax load:

. . . Omnibus tax hike of 10%. This bill includes current levies on oil and gas production and well servicing. TMOGA estimates more than 60% of the hike would fall directly on oil and gas.

. . . Severance beneficiary hike on gas. Proposal would hike tax, now at 1½% of value, to 3%. This tax may well be declared unconstitutional. Even if it isn't, a 3% tax, plus the current 7% production tax, plus ad valorem taxes would be an unreasonable burden on Texas gas.

. . . Gas-processing tax. This proposed new tax of 1 cent per M.c.f. would be a discriminatory tax on manufacturing and force shutdown of many plants that conserve gas produced with crude oil. It would thus cause waste and at the same time discourage construction of new petrochemical plants that use gas as raw material.

. . . Gross receipts tax on pipelines also would discourage expansion of the Texas gas industry. This tax, already on the books at a rate of 0.25%, may also be unconstitutional. Court action already is under way.

. . . Gasoline sales tax hike of 1 cent per gallon. This "basically is an effort to levy a special sales tax on the highway user to meet demands largely unrelated to the highway program." This tax would raise another $35,400,000 a year. Current state and federal taxes on gasoline, TMOGA said, already total 43% of the cost of the fuel in Texas. Texas gasoline taxes increased 25% between 1949 and 1959.

. . . Franchise tax hike. This tax has already increased 275% since 1950. It has brought in $58,000,000 this year. Only three states have corporate income taxes bringing in more than $50,000,000 annually. Texas oil and gas men now bear 30% of this high franchise-tax burden.

The industry's suggestions . . . The TMOGA recommended to the commission that Texas should not further penalize business and industry in the state but should attempt to create a favorable climate for it in its future tax policy.

Furthermore, it said, taxes should be direct rather than hidden. And all state citizens should share in the responsibility for paying them.

Specifically, the association recommended that Texas adopt net income taxes, general sales taxes, or general advalorem taxes to meet its needs for more money.

Engineers' Job Market Perks Up

THE employment market for graduate engineers appears to be looking up a bit—especially for electrical and chemical engineers.

The University of Texas reports it has already scheduled 50 job interviews with its 1961 crop of engineering graduates. And there will be only 435 graduates—down 79 from this year.

The "back-to-engineering" movement, the university thinks, should be aided also by an increase in the number of high-school students attending its summer orientation for those planning engineering careers.

The pay is increasing, too. A U. of T. survey found top salaries for beginning electrical engineers up to $527 a month, $515 a month for beginning chemical engineers. Salaries for mathematicians are really rocketing—going up 11½% in the past year to $515. Chemistry and physics salaries went up 11 and 2%, respectively, to $507 and $522. A chemistry PhD now starts at $806, an engineering PhD at $812.

New Canadian Oil Policy Due This Year

• Production isn't expected to come within 100,000 bbl. daily of the Borden commission figure. So, there'll be pressure to protect the domestic producer.

THE Canadian Government is expected to spell out a national oil policy before the end of the year.

A disappointing rise in production and growing productive capacity has brought forth renewed pleas by independent producers for a Montreal pipeline and government intervention to secure this large market for the Canadian producer. Most major oil producers continue to advocate a hands-off policy by the government.

The government has authorized a "rush" study of the over-all situation by the National Energy Board. In doing so, it gives official recognition to the fact that a market of 700,000 bbl. daily for Canadian oil will not be reached by the end of 1960. This was one of the national goals recommended by the Borden royal commission.

From its study, the NEB will provide the facts and possibly the recommendations on which the government will base its decision.

Canadian output averaged less than 550,000 bbl. a day in the first 6 months, and experts believe 600,000 bbl. is the maximum it can reach by the end of the year. It seems doubtful the higher goal can be reached unless some import control is adopted.

One factor holding production below expectations has been failure of the Canadian market to increase as swiftly as expected. Domestic consumption of Canadian crude is not expected to average more than 440,000 bbl. a day for the year.

Exports to the United States, Canada's sole foreign market, have shown a solid growth, but not enough to fill the gap. A 1960 average of about 115,000 bbl. a day is forecast for these sales.

Government views are a carefully guarded secret, but it would have to choose between three basic positions:

... **A decision** that the Canadian industry, which showed a growth rate of more than 11% last year, does not need assistance at this time.

... **Action** to give western Canadian producers more or even all of the Ontario market. This type of move would assure the domestic industry of a market for some 100,000 bbl. more a day.

... **Imposition** of import quotas, particularly in the Montreal refining area. This might be accompanied by assistance in the construction of a $300,000,000 pipeline to carry western crude to the eastern market.

Producers' views . . . The major or international companies are opposed to any move that would restrict imports from their Venezuelan or Middle East sources. Imperial Oil's vice-president Vernon Taylor recently suggested the answer lies in American market.

The independents questioning the practicality of this proposal noted American producers have repeatedly said they will seek quota action by their Government against any Canadian attempt to increase exports to the U. S. The independents maintain that with production potential continuing to increase, the industry must market.

With Canada suffering from a chronic trade deficit, independents are also quick to point out that closing of the Montreal market to foreign crude could result in a saving of about $400,000,000 a year in foreign exchange.

The government has only said that the NEB has been instructed to make a comprehensive study of current problems, relative to the interests of eastern Canadian consumers, the western Canadian producers and the national economy as a whole.

Seeligson Unit Grows Again

. . . as Humble puts 4,565 acres into this complex recovery project. Unit now claims 672 wells in 66 reservoirs.

THE GIANT Seeligson field unit in South Texas grew even bigger last week.

It took in another 4,565 acres of production formerly operated by Humble Oil & Refining Co. in the King Ranch area of Kleberg County. This is to the east of the original unit boundary.

The new addition brought 121 wells with 150 completions plus two new producing zones into the unit.

The unit bounds now include 18,815 acres, sporting 672 wells with a total of 952 completions in the multizone field. The two new reservoirs bring the total number of producing horizons within the unit area to 66. They are all Frio sand pools.

Sun Oil, the unit operator, says the expansion will permit more efficient and economic production in the field. Sun will continue to operate the enlarged unit. But Humble will produce the King Ranch wells with its own personnel under the direction of the unit operator. Also, Humble will process a portion of the gas from the unit in its new King Ranch gas plant.

Bigger than it looks . . . The unit's acquisition of Humble acreage is more important oil-wise than the acreage figure would indicate.

The new producing-day allowable for the unit is 60,900 bbl., compared with a previous figure of 38,750 bbl.

Major operators participating in the unit, in addition to Sun and Humble, are: Mobil Oil Co., Shell, Sinclair, Sunray Mid-Continent, and Texaco. Unit office is at Premont, Tex. Superintendent in charge of unit operation is G. P. Moncrief.

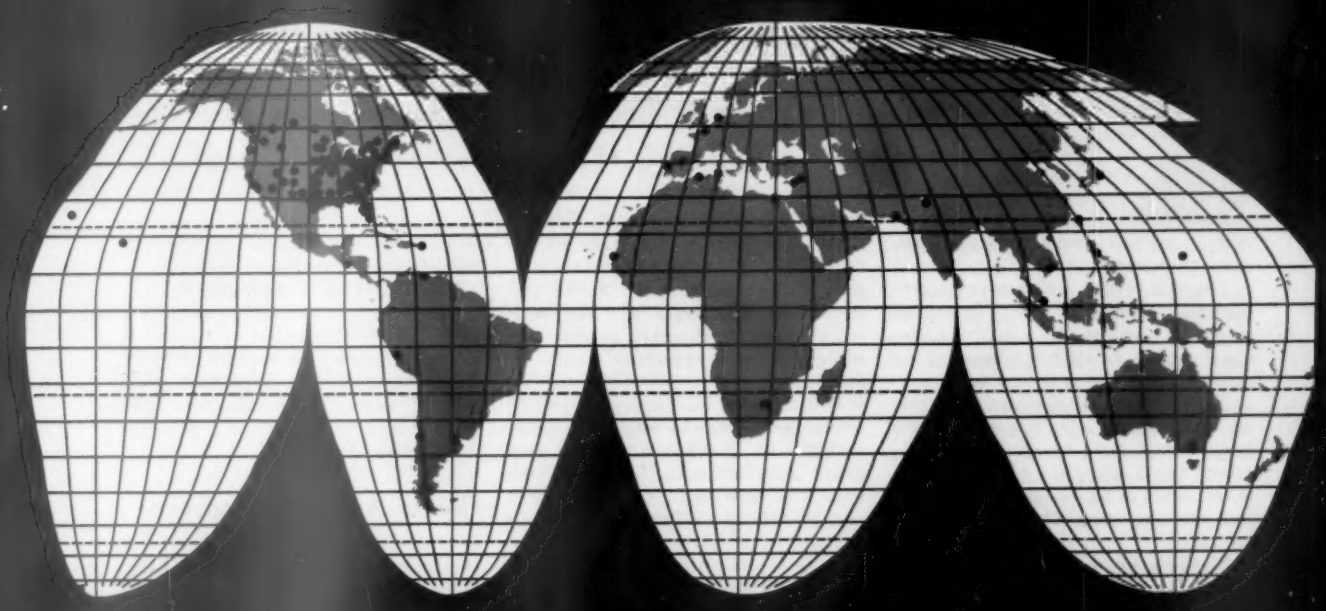
Momentum picking up . . . Sun, as unit operator, started gas-injection operations in the spring of 1958, and injected the first water in June of that year.

Part of the gas is being pumped into the caps of the major oil reservoirs to maintain pressure and control cap movement. The rest goes for cycling gas caps of the larger oil reservoirs and the thin oil columns of other pools.

Though Seeligson boasts 66 different reservoirs, only about 20 of these are believed large enough to support economic fluid-injection programs. These, however, have about 97.9% of the recoverable oil reserves and about 67.2% of the recoverable gas reserves within the unit area and depth.

Since injection started, the program has expanded rapidly until now the unit is injecting roughly 11,600 bbl. of water and 136 million cubic feet of gas a day.

There are 21 water input wells, and 21 more are taking gas. Injection water comes from two shallow sands in the unit area and from the big Seeligson gas plant in the form of cooling or "blowdown" water.



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Louisiana Eases Restrictions on Multiples

• Two allowables are now permitted for dual completions. The temporary order will be in effect while a study of market demand is being made.

PROTESTS of operators on restriction of multiple completions in Louisiana have borne fruit.

The state's new conservation commissioner, James H. Gill, last week eased the 3-month-old order by allowing operators to get two allowables on dual oil completions in new pools.

Under the original order only one allowable was granted per well in new pools (OGJ, June 13, p. 72). An operator could complete his well in as many sands as he wished, but received just the one allowable. Now he can get two.

The new order is temporary. But it will last at least 4 months.

Market analysis planned . . . During this period the Conservation Department, with the help of the industry, will make an intensive study of Louisiana's market demand and the effect of new production on it.

The original order, issued by former Commissioner Ashton Mouton, was designed to halt the steady increase in Louisiana's new production, which was pushing total production well above market demand. Mouton contended he was no longer justified in reducing allowables for prorated wells. They had already dropped to 33% of the March 1953 rate.

The restriction on multiples, however, was greeted with little enthusiasm by many operators, particularly those offshore. Expensive drilling in the Gulf of Mexico, they said, could be justified in many instances only by getting two or more allowables from the same hole.

The operators, including most of the majors, made their protests official at a public hearing last month at Lafayette. They complained that the state was eliminating a powerful economic stimulus to drilling (OGJ, Aug. 15, p. 88). The payout was just too long for single completions.

In relaxing the rule, Commissioner Gill accepted an alternate proposal of Continental Oil Co. Continental had asked that the restriction on multiples be lifted entirely and, failing that, it should be lifted on duals. It is the latter suggestion that Gill followed.

Gill said the complete ban on multiples is "no longer appropriate" and that, if continued, "probably will cause the drilling of unnecessary wells and financial hardship to a substantial segment of the oil and gas industry."

At the hearing in August, Gill invited the industry to undertake a long-range study of Louisiana's market supply and demand problem to the end that allowables could be fixed realistically and unnecessary drilling and other inefficient practices could be avoided.

Gill renewed his request in issuing last week's order and asked companies to file with the department all pertinent data accumulated during the next 4 months and recommendations on how to keep production in line with demand over the long haul. Particularly he is interested in how to handle new production, much of which comes from multiple completions.

Drilling not hurt . . . The restriction on multiples apparently failed to slow down drilling in the Gulf of Mexico during the 3 months it was in effect, although the effect probably would have been felt over a longer period. Operators had been hopeful they would get some relief on the restriction and had not cut back their drilling programs.

One effect of the modified ruling probably will be a sharp increase in new production for September or October because of the backlog of multiple completions made since June 7, date of the first restriction. Operators are expected to ask for a second allowable on all such completions.

The action on multiple completions is part of an overall effort of Louisiana to update its allowable system. Gill has set a hearing for September 28 at Baton Rouge on a proposed order granting higher allowables for wells drilled on larger spacing patterns (OGJ, Aug. 29, p. 60).

Floods Awaiting Approval

The Texas Railroad Commission is expected to approve soon water floods in two Texas fields which would recover a total of more than 7,975,000 bbl. of added oil.

The proposed projects are in North Moss Hill and Panhandle Hutchinson fields. The North Moss Hill flood would be conducted in the Cockfield pay by Texas Gas Exploration Corp., as unit operator.

Three cooperative floods are planned in Panhandle Hutchinson's dolomite pay by Kewanee Oil Co., Sunray Mid-continent Oil Co., and Phillips Petroleum Co.

The North Moss Hill project would yield about 3,330,000 bbl. of added oil, the Panhandle Hutchinson operations a total of about 4,645,000 bbl.

PIPELINE BRIEFS . . .

Rules governing right-of-way permits on Indian lands have been eased by the Interior Department. Now such permits can be obtained for terms up to a maximum of 50 years compared with the old terms of 20 years with a 20-year renewal.

Texas Eastern Transmission Corp. has been given the green light by the FPC on its plans to expand its facilities centering in North Central Pennsylvania. The plans include construction of 215 miles of pipelines, a 3,300-hp. compressor station at Perulack, Pa., and added metering and regulating stations. The order will allow Texas Eastern to develop its portion of underground storage in Leidy and Tamarack pools. Total cost, exclusive of the underground storage, will be $40,668,000.

Michigan Wisconsin Pipe Line Co. is laying 60.4 miles of 30-inch line in Indiana and Michigan. The Indiana portion consists of 46.7 miles in Lake, Porter and LaPorte counties and the Michigan portion, 13.7 miles in Berrien County. Bechtel Corp. is the contractor on the job which was scheduled to get under way September 1.

Plantation Pipe Line Co. is replacing the 73-mile, 4-in. section of the products line between Helena, Ala., and Birmingham, with 8-in. Latex Construction Co. of Georgia has the contract on the job which is due for completion by October 1.

Federated Pipe Lines, Ltd., joint Home Oil and Texaco Canada enterprise, will add a 36.5-mile, 16-in. loop to its Swan Hills-Edmonton line which

Ten Oil Firms Back New Line

A 200-mile products line of 12 and 16-in. from Chicago to Milwaukee and Green Bay, Wis., is planned for construction next year by West Shore Pipeline Co., backed by 10 oil companies.

The pipeline would carry products from Chicago area refineries to the Milwaukee consuming area now supplied by lake tankers.

The line would supplement tanker transportation in the beginning with initial throughput of less than 100,000 bbl. daily, growing to 175,000 bbl. and eventually replacing tankers.

The stock of West Shore is owned by Pure Oil Co. and Interstate Oil Pipe Line Co., a subsidiary of Standard Oil Co. (N. J.).

Participants in the project also are expected to include Socony Mobil Oil Co., Inc.; Texaco Inc.; Standard Oil Co. (Ind.); Shell Oil Co.; Ohio Oil Co.; Cities Service Oil Co.; Continental Oil Co.; and Clark Oil & Refining Corp.

Interstate has been conducting studies for the affiliated Humble Oil & Refining Co., whose Oklahoma-Pate Division actually would take part in the project.

Final agreements have not been completed, but it is understood that all of these companies will come into West Shore.

Sizing of the line is subject to change, depending on the number of participating refiner-marketers, but it is expected to be a 16-in. main line, with 12-in. laterals to Milwaukee and Green Bay.

The pipeline backers hope to reduce transportation costs by eliminating excessive winter storage required in tanker movement and by eliminating the uncertainties of winter tanker deliveries.

Another Naphthalene Plant Planned

A PETROLEUM naphthalene plant, the fourth in the U. S., is under serious consideration.

Tidewater Oil Co. and Collier Carbon & Chemical Corp. are expected to wrap up details soon for a 50-million-pound plant at Collier's Los Angeles petrochemical plant. The two companies in June announced plans to build a similar plant at Tidewater's Delaware City refinery.

Currently there is no petroleum naphthalene production in the U. S., but two plants other than the Tidewater-Collier plants are being built. Sun Oil Co. is building one at Toledo and Ashland Oil & Refining Co. one at Ashland, Ky.

The only naphthalene produced on the West Coast is coal-tar naphthalene manufactured by Kaiser Steel at its Fontana works. Production ranges between 10 and 15 million pounds annually.

Wilshire Oil Co., a subsidiary of Gulf Oil Corp., has said it is interested in getting into the naphthalene field, but made no announcement of plans to build a plant.

Both Tidewater-Collier plants will use a hydrodealkylation process patented by Union Oil Co., Collier's parent. The process converts alkyl naphthalene into high-purity naphthalene.

Both Union and Tidewater are scheduled to supply raw materials for the plant. If final details for the plant are worked out soon, it will be completed late in 1961.

The two companies say they are getting into the naphthalene field because of a sharp drop in imported naphthalene and an inadequate supply of coal-tar naphthalene.

Blast Furnace to Use Gas

THE FIRST full-scale blast furnace in the world equipped to use oil or natural gas as fuel, in addition to coke, has started producing iron in Hamilton, Ont.

Frank S. Sherman, president, and H. C. Taylor, superintendent, lit up Hamilton's seventh blast furnace at Dominion Foundries and Steel Limited's Bayfront plant.

The $10,000,000 furnace will make more than 1,000 tons of molten iron a day.

Steelmakers are exploring ways to use Canada's vast petroleum reserves to cut down on the heavy fuel bills involved in importing coal.

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will increase the capacity to 56,000 bbl. per day. This is the second major loop added to the line this year. The first linked Oliver and Station No. 2 while the second extends the double line to Fort Assiniboine. A 1,000-hp. pumping station and 35,000 bbl. of storage will also be added at Swan Hills. Contract for the second loop has been awarded to Majestic Contractors Ltd.

Alberta Gas Trunk Line Co. has delayed its plans for additional financing until early 1961 because of the "late approvals of the import of gas into California." It had planned to offer security issues totaling $110,000,000 next month. Of the total, $65,000,000 will be marketed in the U. S. and $45,000,000 in Canada.

Increased operating costs have forced Vickers Refining Co. to raise the service charge on its gathering system in the Potwin area of Kansas. It was the first increase since 1955 and put the per barrel change up to 10 cents from the previous level of 6½ cents. Some 4,500 bbl. per day is involved.

Clear Creek, Inc., of Wichita, Kans., expects to complete its system of approximately 25 miles of transmission line and 15 miles of gathering lines in eastern Kansas by October 1. Harry K. Phipps, formerly of Magnolia, is president of Clear Creek.

Continental Pipe Line Co. will build a 21-mile, 8-in. crude-oil pipeline from Grand Isle to Golden Meadow, La. The line will be equipped with a 200-hp. pumping station. The line is scheduled for completion before the end of this year.

Plans of Provincial Products Pipelines Ltd. for the construction of an extensive products system in Alberta will be the subject of a hearing by the Alberta Oil & Gas Conservation Board September 20 in Calgary. The system will cost $25,000,000 and will range in size from 12¾ to 4½-in. In addition to supplying industries within Alberta, connections would be made with Interprovincial and Trans Mountain pipeline to supply export markets.

Also for Pipeliners . . .

IN THE NEWS: Decision due this year on crude line to Montreal when new Canadian petroleum policy is announced (p. 78) . . . Work plans are mapped for construction of Alberta-to-California gas line (p. 84).

PLUS THESE TECHNICAL REPORTS: LACT saves money in Four Corners (p. 107) . . . Automatic pipeline features automatic batching (p. 128).

Way Cleared for Building Helium Plants

• Interior is authorized to negotiate construction of 12 plants or, failing that, to build them itself. Effective date for contracts: Next March 1.

HELIUM legislation, pushed hard by the administration, squeaked through Congress before the short session collapsed into a political heap.

It had a close call, though, because objections had been raised to some points of the proposed bill. These were finally taken care of in last-minute compromises, and the legislation was sent to the White House.

This sets the stage for Interior Department to negotiate contracts with oil and gas firms and others to construct plants which will strip helium from natural gas to supply the nation's rapidly increasing helium needs.

Should Interior fail to negotiate such contracts, it is authorized to build up to 12 plants itself.

As finally passed, the legislation excludes helium recovery operations from control by the Federal Power Commission. Income from helium sales is likewise excluded when the FPC sets rates for natural gas that has been stripped of its helium content.

However, in its gas rate-making, the FPC will deduct from the rate base certain costs attributed to helium, before the helium is separated from the natural gas.

Thus, the deductions will be for helium's share of exploration, drilling, production, transportation, and other costs incurred before the helium reaches the extraction plant. From that point on, helium costs will have no bearing at all on the gas-rate base.

Even at the point it does consider helium costs, the FPC will be required to do so on a volumetric basis rather than on the basis of the value of the helium. The latter approach had been proposed at one time.

The change has considerable significance because the amount of helium contained in natural gas is minute—generally ranging from .4 to .8 of 1%. So the costs deducted from the natural-gas rate base would amount to very little.

Had the splitting of costs been on a value basis, however, the portion assigned to helium would have been considerable. It has been estimated that the producer will sell the helium content for about $10 per M.c.f., compared with 10 or 15 cents per M.c.f. for natural gas.

Under the value approach, therefore, the producer would have to attribute a much larger amount of costs to helium, thus reducing the amount of costs he could subtract in preparing a rate base for natural gas.

The change from a value approach to a volumetric approach was suggested by Under Secretary Elmer Bennett, who feared that the former approach might cause some gas firms to lose interest in building helium extraction plants.

The final version of the legislation specifies that it will become effective next March 1.

The purpose of the date stipulation was to make sure that no contracts were signed before a new administration had an opportunity to examine them.

However, there seems to be nothing in the language of the bill to prevent Interior from beginning negotiations immediately with any interested firms—just so no contract is signed before the effective date.

Interior Department, in seeking action on the legislation, had warned Congress that this nation faces a helium shortage unless prompt action is taken to recover the helium from natural gas.

Most of the helium is used by the Government, but there are increasing commercial uses, too.

The terms of the new law apply equally to helium recovery operations for sale to the Government and those for sale to private industry.

INDUSTRY BRIEFS . . .

LPG storage in the Salado salt formation under the Headlee Devonian field unit in West Texas has been approved by the Railroad Commission. Texas Gulf Producing Co. will leach out a 50,000 bbl. cavity. The well will be located in Section 29, Block 41, T-2-S, T&P Survey, Ector County. Storage capacity may be enlarged later if necessary.

Gas reserves of Saskatchewan's Hatton field have been purchased by Saskatchewan Power Corp. Largest interest in the field was held by United Canso Oil & Gas Ltd., which had 49%. The company sold its interest for $2,900,000 and retained a 5% gross overriding royalty. Four other companies held the remaining 51% interest in the field.

New production publications have been issued by the Division of Production of the API. The publications are: Subsurface Salt Water Disposal; Standard Procedure for Evaluation of Hydraulic Fracturing Fluids; Core-analysis Procedure; Basic Electricity for the Petroleum Industry; and Operation of Electrified and Automatic Leases.

Acquisition of Christiana Oil Corp.'s interests in producing properties in five states has been announced by Producing Properties, Inc. Most of the properties are in Texas and Kansas and crude reserves purchased are estimated at 1,920,000 bbl. Also acquired were natural gas and LPG reserves.

North Texas has a new drilling-depth record at 18,008 ft. The deep record-breaker is The Grande Corp. 1 T. W. Harshbarger unit in the Reuben Alexander Sur., A19, 6 miles northwest of Pottsobro in the northwestern part of Grayson County in the Marietta basin. The old record holder was Humble's 1 Williams, drilled in 1953, in the D. Yglesias Sur., A-1393, also in Grayson County. It was dry at 14,363 ft. The new dry hole is 5 miles north of production in Northeast McMillian field. The well was spudded on June 16. Completion was announced last week.

Purchase of gas reserves estimated at 68½ billion cubic feet has been made by Crestmont Oil Co. of Los Angeles. The company acquired the reserves with the purchase of Banquete Gas Co. and Banquete Pipeline Co. which operate in Nueces and San Patricio counties, Texas. The purchase also included Taft Processing Co. which operates a natural-gasoline plant.

Assets of Oil Operations, Inc., Galveston, have been acquired by Jade Oil Co., Beverly Hills, Calif., in exchange for 135,342 shares of Jade common stock. Oil Operations has 21 producing wells in Ft. Bend, Liberty and Jefferson counties, Texas. Reserves of these wells are estimated at more than 700,000 bbl.

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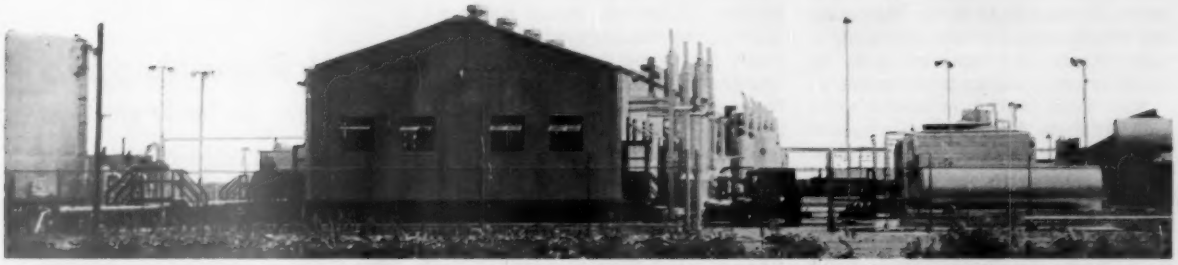
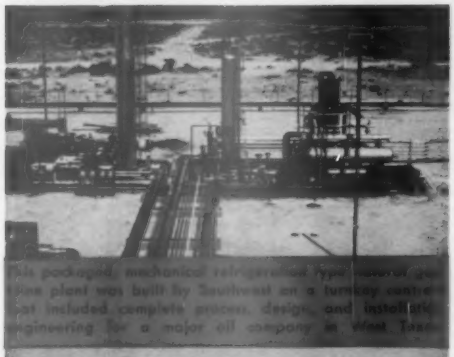


Southwest designed, engineered and installed this prefabricated water pumping station for a Pan American Petroleum Corporation unitized water-flooding operation in Southwest Texas.



This packaged, mechanical refrigerated type natural gas dew point plant was built by Southwest on a turnkey contract that included complete process, design, and installation engineering for a major oil company in West Texas.

This barge-mounted compressor station, including dehydration facilities and incorporating 1600 h.p. of compression in four units, is utilized in offshore gas boosting (transmission sales by the CATC Group at Grand Isle, La.

In main line boosting for a major gas transmission company along the Texas Gulf Coast is this compressor station of four 660 h.p. packaged integral compressors, built completely on a turnkey contract.

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British Charter Ships to Reds

. . . for moving crude, despite Jersey's boycott threat. It's the only bright spot in a lagging tanker market.

BRITISH tanker owners, restive under an implied boycott threat against hauling Russian oil, are succumbing to attractive Soviet offers.

Reports circulated in London and New York shipping circles that as much as 1,000,000 tanker tons had been chartered from two British firms—London & Overseas Freighters and Cambridge Tankers—for 2 to 3 years. Rates were reported to be as much as twice the current market.

New York brokers expressed some doubt that the Russians had obtained the large tonnage reported, but they did not doubt that deals were being made for the Black Sea-Havana run and the regular Soviet export trade.

When Premier Fidel Castro seized the Cuban refineries of Standard Oil Co. (N. J.), Royal Dutch-Shell, and Texaco Inc., Jersey announced in July it would take into consideration in future chartering whether a tanker operator had done business with Russia.

The breaking of shipping ranks had been expected for weeks, as hard-pressed ship owners—particularly British—were openly critical of efforts to fence them off from this business. Soviet chartering has provided the brightest spot in an otherwise badly depressed tanker market.

None of the Soviet charters are actually on record. But it was considered common knowledge in the industry that some were being "fixed." The charters involving the two British firms are the first sizable ones reported. They are believed to have been made some weeks ago, and others are expected to come to light.

Soviet chartering is not considered a mere short-term activity to free tankers to supply the seized Cuban refineries, which have been operating at about half capacity. It is part of the Reds' long-term plan for expanding world markets in the economic phase of the cold war, and abnormally low tanker rates are serving these purposes very well.

Special Rule Asked for Record Well

THE TEXAS Railroad Commission is expected to rule soon on Atlantic Refining Co.'s request that its new record-depth producer in Pecos County, Texas, be designated as producing from a single reservoir.

The discovery, the company's 1 J. C. Kelly in Section 81-51-T10-T&P Survey, 30 miles west of Fort Stockton, found commercial gas in four zones—the Upper and Lower Montoya sections, the Fusselman, and the Devonian.

The Lower Montoya flowed 4,618 M.c.f. of gas daily through a ½-in. choke from sections between 16,550-680 ft. to set a new deep-producing mark for Texas. The old record holder was a Pure Oil Co. well completed at 16,264 ft. in Galveston County.

The 1 Kelly also gaged 7,738 M.c.f. daily from the Upper Montoya at 16,228-16,402 ft., 10,846 M.c.f. daily from the Fusselman at 16,061-16,170 ft., and 16,100 M.c.f. daily from the Devonian at 15,831-15,982 ft. All flows were through ½-in. chokes.

Closest comparable production, Atlantic says, is 38 miles northwest in the Toyah Siluro-Devonian field in Reeves County.

Atlantic, in its hearing for rules for the new field, asked that all four zones in the 1 Kelly be declared a common reservoir. It based its request on core data which showed a myriad of vertical fractures connecting the various zones.

The Atlantic well has been hailed as one of the most important finds yet in the big enigmatic Delaware basin in West Texas.

Sales Offensive

. . . is launched by API to swell the gasoline market.

THE API marketing committee has decided that the best way to achieve a better balance between gasoline supply and demand is to get cars on the road more.

An ambitious campaign to accomplish this and improve other oil markets was detailed last week by C. J. Guzzo, vice president of the marketing division of API, at a meeting of the Maine Petroleum Association.

The growing popularity of small cars and resistance to tax-inflated gasoline prices has led the API to the conclusion that the only way to boost gasoline sales is to persuade motorists to run up more mileage.

It will attempt to accomplish this primarily by pushing auto travel in newspaper editorial and advertising space and by supporting a program to create greater highway safety.

Other facets of this marketing offensive include:

. . . **Allocation** of $500,000 to speed research on more efficient oil heat.

. . . **Fighting** coal-industry efforts to legislate use of coal in place of oil for certain consumers.

. . . **The campaign** of the Tax Education Committee to remove the temporary 1 cent federal tax on gasoline (OGJ, Sept. 5, p. 95).

Work Plans Mapped

. . . for an early start on Alberta-California line.

IF CONSTRUCTION plans as now envisioned are followed through, the recently authorized 1,404-mile, Alberta-California natural-gas pipeline will be in operation late in 1961.

Laying of main-line pipe on three of the four sections is scheduled to begin about April 15, 1961. It is expected to be completed late next fall. The project got the final okay from the California Public Utilities Commission Aug. 16 (OGJ, Aug. 29, p. 49).

Pacific Gas & Electric Co., which will build, own and operate a 296-mile section from Oregon to San Francisco, will probably jump the gun on the other sections and begin laying main-line pipe this winter.

Deliveries of the 36-in. pipe, meanwhile, have already begun along a 614-mile section through Idaho, Washington and Oregon. This section, 104 miles in Idaho, 152 miles in Washington and 358 miles in Oregon, will be the property of the Pacific Gas Transmission Co.

Much of the physical work on the line also will go on through the winter. This will include right-of-way clearing, building access roads, rock blasting and preparation of river, railroad and highway crossings. There will be 14 major river crossings on the route which ranges in altitude from sea level to 6,600 ft.

The two other sections, 386 miles in Alberta and 108 miles in British Columbia, will follow pretty much the same schedule. These sections will be built, owned and operated by Alberta Gas Trunk Line Co., Ltd., and Alberta Natural Gas Co., respectively.

Pacific Gas & Electric Co., principal sponsor of the line, will distribute the gas in North and Central California. Construction contracts are to be awarded about Sept. 26.

National Oil Firms: Growth with a Limit

• The number of government-owned oil companies is increasing around the world, but the private companies still offer a better deal. The outlook: A balance between national pride of ownership and sound economics.

Ray G. Gibson
District Editor

VENEZUELA'S new national oil company soon will start operations.

Saudi Arabia is thinking about creating a General Petroleum Authority with a certain degree of autonomy.

India is pushing forward a government-run exploration program.

Italy is trying to build a vast overseas, integrated oil operation.

France is seeking a behind-the-scenes-voice in domestic marketing operations.

How much of a squeeze will these and other government operations put on established oil companies?

One of the best places to find out may be where governments already have a direct hand in running part of their country's oil business. All signs indicate that despite inevitable problems, private companies still will supply the overwhelming amount of liquid energy throughout the free world for decades to come.

Historically, government companies have had tough sledding fulfilling their goals, and none can be termed completely successful. It is true that governments are working along more sensible lines in setting up companies than they sometimes have done in the past.

Even so, private companies still offer too good a package for most countries to turn down.

Venezuela is an example of the sophisticated approach now taken by governments moving into the oil business. It made firm plans for Corporacion Venezolano de Petroleos only after studying existing government-controlled firms.

Venezuela's program . . . The government firm has been set up to eventually engage in all segments of the oil industry in competition with private companies. It will have no special privileges except that it has received, gratis, concessions where commercial production is considered sure.

The company has long been a dream of President Romulo Betancourt. Its formation was a foregone conclusion when all major political parties campaigned for it in the 1958 election.

Venezolano de Petroleos at first will drill offset wells along the edges of private concessions to stop drainage. Pools may be unitized, with private operators possibly required to market the government's share of the oil. Eventually, the government will branch out into other operations, including foreign marketing.

Government operations differ . . . Venezuela says its national company is modeled after Italy's ENI.

Every government company, however, is unlike any other, and in some cases it is almost impossible to draw a line between what is, and is not, a government company. Mexico's Pemex is the only one with a complete monopoly on all aspects of the domestic industry.

British Petroleum, on the other end of the scale, is virtually no different from any other major international company. The British Government exercises nearly 55% of the voting rights and appoints two members of the board of directors. But in practice the government keeps its hands off, and BP operates strictly as a private enterprise.

Other government companies fall somewhere in between. CFP is usually considered the French - Government company. But technically it is not because private stockholders control a majority interest.

The Spanish marketing monopoly, CAMPSA, is owned only 30% by the government. But it holds its monopoly at the will of the government and therefore is considered by some as a government-controlled enterprise.

Why they are formed . . . In some cases, government companies are formed by socialistic-minded governments. In other cases, antagonism toward foreign capital is the basic reason.

But political philosophy and anti-foreign feelings are not so widespread a motive for forming national companies as is sometimes thought.

The British Government, for example, acquired control of what is now BP to insure oil supplies for the Royal Navy.

Two companies were a direct outgrowth of World War II. Finland's Neste O/Y, operator of the country's only refinery, was organized after a peace treaty obligated the country to take supplies of Russian crude. Austria's OMV took over producing and refining properties returned by Russia.

Problems . . . National oil companies frequently are charged with overstaffing, bureaucratic inertia, inefficiency, and lack of competitive stimulus. These criticisms are sometimes true, and some government firms occasionally go through a reorganization crisis.

But the overriding problem of most government companies is a lack of capital resources.

National oil companies generally are undercapitalized from the start, can't generate enough income to expand on their own, and are unwilling or unable to raise capital in money markets. The government-owner is not able to supply the funds because of limited resources and a variety of mouths to feed.

Some companies, such as Pemex, are called on to finance other government operations. Pemex, however, is trying to break away from the traditional pattern by floating large loans from U. S. and European banks.

Still another almost universal problem is a lack of trained manpower. Although there are many able executives and operating people in the ranks of government companies, there just aren't enough to go around.

Future of private firms . . . It is the ability of private companies to solve these problems that assures a welcome in foreign areas.

Private firms offer the capital and skill, as well as markets for big production, that many individual governments cannot hope to match. Private companies can also argue that the most successful of the government

A look at capacities of government companies

In the East

	Refining Capacity (Barrels	Crude Production Daily)
ENI, Italy	*86,500	**15,500
NIOC, Iran	5,000	6,000
Turkiye Petrolleri	6,950	6,500
Egyptian Government, UAR	26,000	†21,300
Syrian Government, UAR	20,000	
Neste O/Y, Finland	25,000	
OMV, Austria	37,750	41,500
Iraq Government	46,500	3,500

*Includes ENI share of capacity of partly-owned refineries. **Includes share of production through partly-owned Egyptian affiliate. †Includes government's share of production through partly-owned affiliate. ‡Excludes output by private companies under contract.

In the West

	Refining Capacity (Barrels	Crude Production Daily)
Pemex, Mexico	357,000	270,000
Petrobras, Brazil	135,500	76,000
YPF, Argentina	166,700	‡106,000
YPFB, Bolivia	12,250	8,400
Ecopterol, Colombia	41,500	28,000
ENAP, Chile	24,000	19,000
ANCAP, Uruguay	28,000	
EPF, Peru	1,200	2,500
TOTAL	1,019,850	604,200

firms are those which operate most nearly like a private company.

Several countries have admitted or readmitted private operations on a contractual basis with the government firms. These include Iran, Bolivia, and Argentina. In each of these cases, the oil industry was nationalized and then became relatively stagnant. When private capital was readmitted in Iran and Argentina, under terms that satisfied the national pride, a startling rejuvenation took place.

Are they a success? . . . There are too many factors involved to pass individual judgment on government companies as successes or failures. Financial data is frequently lacking. Governments sometimes want to keep an uneconomic project alive for non-economic reasons.

Pemex might not be considered a financial success, but Mexico believes this is secondary to keeping the country's fuel costs down. While the advisability of this can be debated, this is what the country has wanted.

The list of government organizations directly involved in oil operations is a long one. Here are sketches of a few of the leading ones:

. . . Ente Nazionale Idrocarburi (ENI) is criticized at home for engaging in foreign ventures instead of developing local oil and gas resources. It is criticized abroad for making oil deals that threaten to break down existing 50-50 profit-split agreements between private companies and the governments of producing countries.

But ENI's boss, Enrico Mattei, is the hero among other government companies for his attempts to build a major international company on a shoestring basis. In Italy, Mattei's organization is virtually a private empire. It is legally a corporate entity which can own property, sue, or be sued. It must obey business laws and pay taxes.

ENI has four main operating subsidiaries each of which has an array of partly-owned affiliates touching all phases of Italian energy industries. It is better off financially than most government operations because it derives much of its capital from profits on its gas business in northern Italy.

The gas is produced at low cost and sold at a relatively high price. Mattei brushes aside consumer complaints of high prices, saying these prices not only supply development funds, but they have the merit of discouraging migration of industry to the north at the expense of underdeveloped southern Italy.

On Mattei's behalf, it can be said that foreign exploration prospects may offer a better bet than domestic. Natural gas production in the Po Valley expanded rapidly from 1950-57. Since then, however, expansion has been slow.

ENI has made a series of concession agreements generally working out to a 75-25 profit split favoring the foreign government. It reportedly has a discovery in Iranian waters at the head of the Persian Gulf. It has some production on Egypt's Sinai Peninsula through 40% interest in International Egyptian Oil Co., and has concessions in Tunisia, Morocco, Libya, and Somalia.

The company has a balance sheet that is in the black. But its foreign successes largely are still on paper, and whether the agreements work to the company's benefit in the long run remains to be seen.

. . . Petroleos Mexicanos (PEMEX), probably the most famous of government companies, is today producing about 265,000 bbl. daily, or half the volume of crude produced in 1921, the peak year of private operation.

Pemex personnel took over in 1938 at a time when production was down, exploration was off, and refineries were obsolete. A law passed 2 years after the 1938 nationalization assigns 60% of the net income to the government. This is on top of royalty payments of 10% to 35%. Another 20% of the net is earmarked for labor, and the remaining 20% is left for the reserve fund.

Pemex is now undergoing reorganization. But the company, originally intended for the benefit of the Mexican worker, reportedly has a labor relations problem and is troubled by dissension.

. . . National Iranian Oil Co. (NIOC) operates the oil industry in all parts of Iran except areas operated by Iranian Oil Participants, Ltd., known as the consortium. The company is carrying on an exploration program in the Alborz area, where it has a major discovery. It produces about 6,000 bbl. daily from Naft-i-Shah field.

The consortium produces more than 900,000 bbl. daily and operates Abadan refinery in southern Iran on behalf of NIOC, which is legal owner of all fixed assets.

NIOC enjoys automony in its own operations, except that agreements with other operators must be approved by the government. Joint exploration companies for work in non-consortium areas have been formed with ENI, Indiana Standard, and a Canadian company, Sapphire Petroleums.

NIOC's income is derived from the sale of all products in Iran, and from payments by consortium members amounting to 12½% of the posted price of crude exported, or refined for export.

. . . **Yacimientos Petroliferos Fiscales (YPF)** took a new lease on life when the Argentine law was changed 2 years ago to permit the reentry of foreign capital for drilling, production, and equipment on a contractual basis.

Crude production since then has increased by 50% to over 150,000 bbl. daily and it is climbing rapidly. YPF retains title to the oil produced and administers the contracts. Private companies were granted no new concessions after 1935. But since then they have continued to operate old producing properties, and participate in refining and marketing.

All marketers in Argentina are required to turn over 50% of the sales value of their products to the National Energy Fund. YPF is believed to owe at least $150 million, but there is some doubt that payment will ever be made.

. . . **Petroleo Brasileiro, S.A.** (Petrobras) has a monopoly on all exploration and production and on all new refinery construction in Brazil.

Its best successes have been in development of more than 75,000 bbl. daily in Bahia fields, found by an earlier government company; and in refinery construction. It has made its poorest showing in finding new oil fields. But its resources are too limited to adequately explore the inhospitable Amazon basin, a sedimentary area covering a million square miles.

State and municipal governments hold stock in Petrobras, as well as the federal government. Brazilian citizens may also acquire shares through an exchange for gasoline and automobile tax receipts. Its income is derived from a portion of tax revenues on petroleum products and vehicle imports; a 5% share of foreign exchange earned from all types of exports; and 80% of the foreign exchange saved from refinery operations.

ENI's Enrico Mattei
. . . The hero of nationalists.

Private companies handle all marketing in Brazil and operate refineries which were built before 1952. These may not be expanded.

Others . . . There are several other government companies in Latin America, including Empresa Colombiana de Petroles (Ecopetrol). It was organized in 1951 to take over the De Mares concession and Barrancabermeja refinery at the expiration of an agreement with International Petroleum Co. International continues to operate the refinery on a long-term lease.

Yacimientos Petroliferos Fiscales Bolivianos (YPFB) under a 1955 law, can make contracts with private companies in one zone of Bolivia, providing it retains 50% interest. Other zones are open to foreign capital on a concession basis. YPFB produces about 8,400 bbl. daily, and has a monopoly on refining and marketing.

Empresa Nacional del Petroleo (ENAP) produces 19,000 bbl. daily in Chile under its monopoly covering exploration, production, and refining. Private companies participate in marketing.

Administracion Nacional de Combustibles, Alcohol & Portland (ANCAP) is in the cement, alcohol, and sugar business as well as the oil business in Uruguay. It operates the country's only refinery, and has contracted exploration work to private firms.

Peru's Empresa Petrolera Fiscal serves as the country's concessionaire with authority to make agreements with foreign firms. But it also has small production of its own, and certain exploration areas are reserved for the company.

The French Government has a financial voice in most French oil activities through its Bureau de Recherches de Petroles (BRP) which has varying ownership in an intricate maze of companies.

In the Middle East, both branches of the United Arab Republic have government-owned oil activities. The Egyptian Petroleum Authority produces 5,000 bbl. daily from Ras Bakr field on the mainland. It has a joint producing venture with ENI and Petrofina which Venezuela considers a model setup for this type of arrangement. Syria operates a refinery at Homs.

The Iraq Government has a refinery at Baghdad and produces several thousand barrels daily from a Khanaquin field in southern Iraq, surrendered by BP. Turkish Petroleum Corp. handles all crude production in that country, but it is required to compete on equal terms with private companies.

Libyan Stepouts Strike Pay

STEPOUTS to two Libyan discoveries have come in as producing wells in evaluation programs in progress across all of northern Libya.

American Overseas, jointly owned by Texaco and California Standard, produced 750 bbl. of water-free oil in a 10-hour open-flow test on B6A in Beda field. The 36.4°-gravity oil flowed from 4,124 ft.

The company is moving in a rig for the next test on the block, E1-47. It is logging its A1 well in Concession 46 at 11,731 ft.

Libya Shell has completed its A3 well on Block 70 as an 18-bbl. per hour well from 7,750 ft. Three other rigs are assigned to wildcat duty. In Block 41, A1 is drilling ahead at 12,787 ft. and B1 is reaming at 590 ft. The third rig is moving in for a test at B1 in Block 39.

Oasis Oil has eight outfits drilling outside Block 32, where four rigs are operating. Three units are assigned to Block 26, one to Block 30, one to Block 33, and one to Block 59.

Nelson Bunker Hunt, the last of the original concession holders to start drilling, is at 11,027 ft. in its A2 in Block 2, northern Cyrenaica.

A German company, Deutch Erdoel, is rigging up for its first test in Concession 77 in Fezzan.

Esso Libya has two development wells drilling in Zelten field. No. 9 is drilling ahead at 5,867 ft., and No. 10 from 7,934 ft. Elsewhere in Block 6, a wildcat at Tedma is drilling ahead at 11,752 ft. An affiliated company, Esso Sirte, is moving two more outfits into Block 17, where A2 is drilling ahead at 1,175 ft.

Among the other operators, Mobil has three active rigs. The D1 well in Block 13 has been abandoned at 6,700 ft., and the outfit is moving to Block 72. Another test is still in progress on Block 13, and the third rig is drilling at the Hofra find.

British Petroleum has wells under way in Blocks 34, 35, and 80. Gulf is drilling ahead from 9,820 ft. in G1 on Block 66 in the Hamada.

Pakistan Gas Line

. . . network of 1,000 miles may go north from Sui.

A THOUSAND-MILE gas system into northern West Pakistan is under consideration by the Pakistan Government.

The pipeline network would carry gas from Sui field northward from Multan to Lyallpur, Lahore, Daudkhel, Islamabad, Rawalpindi and Wah. The project would require a loop to an existing 310-mile 16-in. line from the Pakistan petroleum field to Multan.

A report compiled by C. S. Snodgrass and G. Gibson & Son, consultants, estimates that the initial cost of gas delivered at terminals would be about 59 cents per M.c.f. Trunk lines in the system could be built in 2½ years from the start of engineering.

In East Pakistan 4-in. drill pipe was used as line pipe at a 170-ft. river crossing in a new 11-mile small-diameter gas pipeline. The pipeline has gone into operation carrying gas from Chhatak field near the northern border to a cement plant. The system opened within 14 months of confirmation of a discovery.

Sahara Concessions Signed

FINAL agreements covering nine concession blocks in the Spanish Sahara have been signed by Tidewater Oil and Standard Oil Co. (Ohio).

Permits covering 5 million acres extend northeastward from the Atlantic Coast to the Algerian border. Eight of the nine blocks, Nos. 7, 13, 14, 24, 48, 52, 53, and 60 were awarded to Tidewater and Sohio by the Spanish Government last spring. The ninth block, No. 56, was obtained during formal completion of the working agreements. This lies immediately south of Block 52 in the east-central part of the country.

H. H. Neel, general manager of Tidewater's foreign exploration and production division, said Tidewater already has a gravity crew surveying part of the Saharan area, and is establishing a base camp for a geological party. A seismic party is en route. Tidewater is operator on the blocks for itself, Sohio, and their Spanish associate, Banco Urquijo of Madrid.

The main operating base will be at Las Palmas, Canary Islands.

New Tanker to Serve Elath

ISRAELI interests have taken delivery on the second of two 46,400-ton tankers that will haul crude to the Elath terminal of a 264-mile 16-in. pipeline to Haifa refinery.

The ships will be able to supply an average of 28,000 bbl. daily to the pipeline from an undisclosed supply source, which is generally believed to be Iran. The newest ship, Aurora, is operated through an Israeli subsidiary of a Swiss company. The Israeli Government and Zim Navigation Co. of Haifa own the sister ship.

Operation of the pipeline has been turned over to Tri-Continental Pipeline, Ltd., of Calgary, which is controlled by a group headed by Baron Edmond de Rothschild. The company has a 49-year concession. The agreement guarantees a minimum net profit of 8% for at least 10 years.

Soviet Power Plans

. . . favor oil and gas as generating fuels.

RUSSIA, like much of the western world, has come to the conclusion that oil and gas furnish the most economic power-generation fuels—far cheaper than atomic reactors or hydroelectric plants.

The first Soviet scientist ever to attend the annual meeting of the British Association for the Advancement of Science said in Cardiff last week that Russia will build five times as many thermal-power stations as power dams in the next 7 years.

W. I. Venikov, professor of electrical engineering at the Moscow Power Institute, told British scientists new sources of oil and gas that have been found in Russia are responsible for the trend. He said in spite of the fact that Russia has some of the largest rivers in the world, thermal-power generation is much more economical because of the high cost of power-dam construction.

He added that any atomic power stations which the Russians may build will be used only for research.

FOREIGN BRIEFS . . .

A British polymer plant with a yearly capacity of 10,000 tons is to go on stream shortly. Production of the Imperial Chemical Industries plant is licensed by Montecatini. I.C.I. has also been granted an exclusive license for the U.K. to produce Montecatini's Meraklon, a polypropylene fiber.

Idemitsu Kosan, a big Japanese independent with a contract for 20,000 to 30,000 bbl. daily of Russian crude for 6 years, plans to build a refinery and petrochemical plant near Tokyo. The company is seeking a site being reclaimed by Chiba Prefecture.

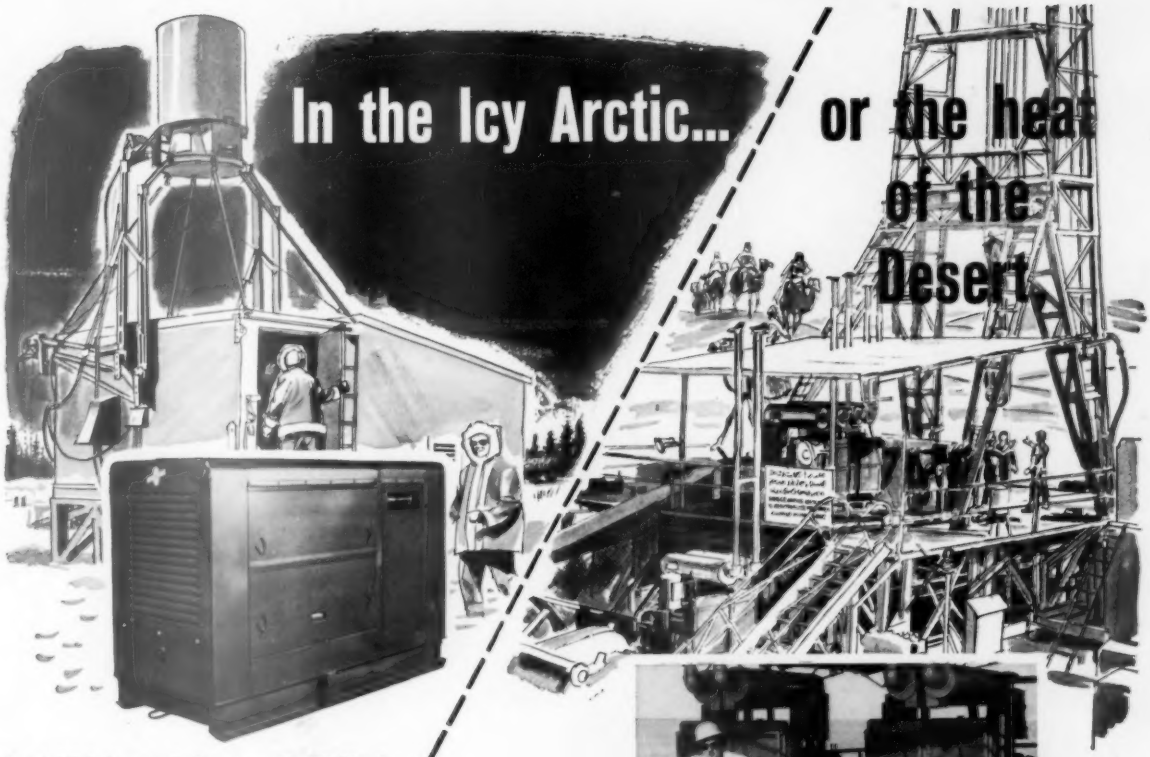
The deepest well ever drilled in eastern Venezuela is being tested by Mene Grande Oil Co. at a total depth of 16,411 ft. The well, Pato 2 in Freites district of Anzoategui, yields 445 bbl. daily of 38°-gravity crude with a 9% water cut in the L 3 sand. Other zones are under test. In Monagas, Creole Petroleum's Acema 1, 3 miles south of Sinclair's East Aguasay 2, tests 1,985 bbl. daily of 24.9°-gravity crude through a ½-in. choke in the S member of the Oficina formation. Total depth is 13,297 ft.

A development program in Brazil's Bahia State will be started this month. Brantly Drilling Co. (International) of Midland, is shipping a new rig to Brazil to initiate the program for Petrobras. Brantly has a rig in Bahia which is developing a 4,000-ft. pay zone. The target for the new rig is a 7,000-ft. zone.

A maleic anhydride plant will be constructed at Niort Deux-Sevres, France, by Ste. Ame. Reichhold Beckacite, an affiliate of Reichhold Chemicals, Inc. Scientific Design Co. will design the 10,500,000-lb. per year plant and license use of the process and special catalyst required.

A Russian steel plant has started commercial manufacture of thin-wall, flat-weld pipe for the country's oil and gas industry. The pipe is formed by welding the edges of 820-ft. by 7⅞-in. section to 11-in. steel strips. The finished pipe is rolled up like a water hose for delivery to the construction site. Then it is unwound and air is pumped into nipples welded to both ends, which forces the pipe into a round shape.

Two Kuwaitis have been appointed to the board of directors of Kuwait Oil Co. by the ruler of Kuwait. They are Mahmud Khalid al-Adasani, who will relinquish his post as petroleum engineer with the company; and Faisal Mansur al-Mazidi, who is in the oil affairs office of the government's Department of Finance and Economy.



Model MB-2 Stewart & Stevenson 30 KW Diesel Generator Set generating power around the clock. The unit provides electric power for operation of electronic apparatus vital to human safety and communications in the Arctic.

Parker Drilling Company rig, powered with GM Model 12103 Diesel Engines. Lighting and auxiliary power are supplied by a Stewart & Stevenson oilfield Utility Unit and Rig Lighting Plant. The engines were properly equipped and modified by Stewart & Stevenson with special cooling and air intake systems.

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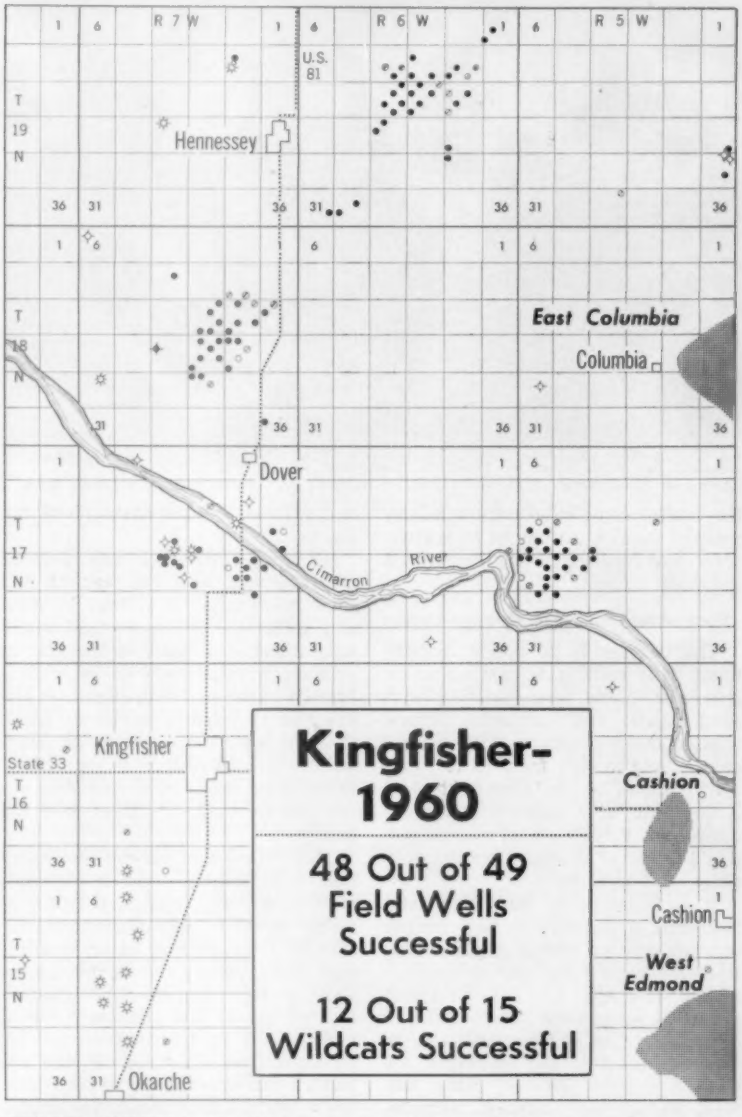


CURRENT ACTIVITY in Kingfisher County is the result of an extraordinarily high success ratio, but . . .

Mid-Continent hot spot owes success to modern well-stimulation techniques

Kingfisher County, Oklahoma, is currently one of the hottest domestic oil areas. Here's the latest rundown on the area and a discussion of the fracture treatments required to initiate commercial production.

CURRENT successful activity has focused a great deal of attention on Kingfisher County, Oklahoma. Strategically located on the Anadarko basin side of the Nemaha ridge, it has had oil (1949 and 1950) and gas (early 1954) production for many years.

Two known major structures exist in addition to the west edge of the ridge proper. However, the present activity is directed at semistructural stratigraphic traps and porosity development in Pennsylvanian and Mississippian age rocks.

Principal formations responsible for the successful ventures are the Oswego lime of Pennsylvanian age, and the Manning sand and Meramec lime of Mississippian age. The Layton, Red Fork, and Cleveland sands of Pennsylvanian age have also proved productive recently.

Engineered well stimulation is needed for the principal productive pays.

- The **Oswego** lime requires a retarded acid-type fracture treatment because of its true lime character and fast reaction rate with regular 15% hydrochloric acid.
- The **Manning** sand especially requires an engineered type of stimulation because of the variance in lithology that occurs. Depending on the lithology, the treatment may be an oil fracture or a retarded acid type of fracture treatment.
- The **Meramec** is usually a fractured lime; however, the amount of shale contamination may make it impractical to approach the stimulation of this zone as a lime. Consideration

BY M. C. RESPESS

. . . technical sales manager for the Oklahoma City division of the Western Co. He came to Oklahoma City from the Midland, Tex., division in 1956. Prior to 2 years as a technical sales engineer in Midland, he served as a treater at the company's Snyder, Tex., district. He started as a trainee in Odessa, Tex., after graduation from University of Texas in 1952 with a BS in geology.

TYPICAL EQUIPMENT HOOKUP needed for high-injection fracture treatment in Kingfisher County.

for the solubility of the rock is essential in engineering a stimulation program and should dictate the choice of either an oil or retarded acid-type fracture treatment.

History and Location (Geographical)

Interest is centered in 19n-6w where dual completions are made in the Manning and Meramec; in 17n-5w, with Oswego as the principal target; and in 18n-7w, where the Manning is most prolific. A gas play is developing south of the town of Kingfisher in 15 and 16n-7w, with production from the Manning. Development wells, extensions, and stepouts are currently staked, drilling, or in the completion state from all the activity centers (see map).

Older production in the area is from West Edmond, East Columbian, and Cashion pools located on the Anadarko basin side of the Nemaha ridge, and South Dover pool in 17n-7w, over a structural high within the basin proper. Another structural high exists in 18n-9w with shut-in gas production from the Manning and Chester zones. No current activity or attention is known to be focused on this latter area.

The success in Kingfisher County (OGJ, July 4, 1960) may hinge on the careful completion techniques developed through a study of rock character and application of engineered treatment design.

Formation Character: Oswego Lime

The Oswego is an oolitic, brown-to-tan lime with occasional oolicastic character. Some contamination with sand, shale, and anhydrite occurs, causing the solubility in 15% hydrochloric acid to vary from 86 to 94%. The reaction of the lime with acid is complete in 5 minutes at surface conditions. Porosity, where developed, will average 14% with a permeability range of 1 to 6 md.

It is fractured in both horizontal and vertical planes with only minute separate and no visible displacement. Reserves have been set at approximately 100 bbl. per acre-ft. Initial potentials range from 100 to 300 bbl. per day flowing and the wells can be expected to flow the allowable for 6 to 8 months average. After this time, pumps are installed. Stimulation is necessary to secure satisfactory initial production.

Fracture treatments engineered for the Oswego are based on three important factors: (1) rapid reaction of the section of hydrochloric acid, (2) the fracture system that exists in the rock, and (3) the low permeability of the pay.

To acidize the rock any distance from the well bore, the reaction rate must be retarded. This may be done with either the gelling method where solid material is added to the acid to produce a viscous gel or by emulsification of the acid with chemicals and kerosine to produce a viscous emulsion. In both states, gelled or emulsified, the acid molecules are tied up in the fluid structure so that they are not free to react on contact with the lime.

This retardation permits the injection of the treating fluid into the formation to the maximum extent permitted by the volume of the treatment and the injection rate before acidization takes place. The acidization is accomplished when the fluid structure fails or breaks and releases the acid molecules. Tide, temperature, and intentional free molecules of acid are factors that control the break. Normally, surface-tension-reducing chemicals are included in the treating solution to speed the cleanup time and prevent emulsification of spent acid water and formation oil.

A volume factor of 500 gal. per ft. of pay has been used as a guide to determining treatment size. Normally

TABLE 1—FRACTURE TREATMENTS IN THE OSWEGO

Section	Operator	Lease	No.	Prod.	No. hours	64th ck. size	Tubing press. (lb.)	Bbl./hr.	Treatment	Inj. rate (bbl./minute)
26-19-6	Jones & Pellow	Corrie	1	254	24	16	200	10.6	Emulsified acid	24.1
14-18-7	Jones & Pellow	Crossley	1	24	6	18	100	4	Emulsified acid	10.6
23-17-7	Tidewater	Vail	2	16	24	14	...	...	500 mud acid	2
26-17-7	Tidewater	Perdue	1	16	24	Pump	...	...	Emulsified acid	12
17-17-5	Texaco	Barker	1	162	24	12	150	6.75	Gelled acid	12
20-17-5	Payne & Cleary	Walker	1	392	17	24	200	23	Emulsified acid	13.8
21-17-5	Big Chief	Travis Unit	1	107	6	24	160	17.75	500 mud acid	3
16-17-5	Bilinda Petr.	Shuttler	1	40	24	12	250	1.65	250 mud acid	3

LARGE FRACTURING PUMPS are needed to meet the requirements of an engineered well-stimulation program. Here are two 750-b.hp. units.

20 to 40 ft. of section is opened and the volumes range accordingly. This design is based on the engineered acidizing guide published by the various acid service companies.

Sand concentrations are set at 1 lb. per gallon of treating fluid but vary slightly according to the operator. Some consideration is being given at this time to eliminating sand from the treating solution on the basis that the lime is soft enough to permit the sand to be imbedded into the matrix.

The second and third factors in treatment design are the natural fracture system of the formation plus the effects of high - injection - rate treatment, and as previously pointed out, the low matrix permeability with only fair porosity. The natural fracture system represents reservoir and drainage vertically and horizontally through the formation and in the natural state is a restriction to the flow of oil until opened by artificial means. Any propping effect is beneficial even though imbedding conceivably does take place.

The low permeability is improved by forcing the treating fluid through the formation and later by acidizing when the emulsion breaks. A high injection rate will result in breaking into more porosity and converting it to permeability. (Twenty-four of the Oswego wells in Kingfisher County have received this type of treatment.) Injection rates have varied from 10-25 bbl. per minute and the treatments are usually conducted down the casing.

Formation Character: Manning

The Manning lithology varies in character from a sandy lime to a limy sand. In accord with this, its solubility range in hydrochloric acid is also great. The lowest reported solubility has been 23% with sand, shale, and anhydrite as insolubles. The highest was 91% with traces of the same insolubles. Porosity and permeability have a wide variance also, but an average of 14% porosity and a permeability in the matrix of 6-10 md. are generally accepted.

The Manning section, like the Oswego, is naturally fractured both vertically and horizontally. Production is basically oil in the east, north central, and central portion of the county and gas in the south central and northwestern part of the county. The Manning gas producer in 5-15n-7w is outstanding with 25,000 M.c.f.d. North and south offsets to this well were recently completed with comparable production.

Oil potentials range from 80 to over 800 bbl. per day with some natural wells. The Manning so far is the most prolific producing horizon of the three and appears now to have a much wider productive distribution. Where stimulation is in order, an **engineered** treatment is advisable because of the inconsistency in formation character.

In engineering a stimulation treatment for the Manning, hand-picked samples or core chips through the section should first be tested for solubility in hydrochloric acid to determine the basic type of fluid to use. Should the solubility be less than 10%, a weak acid (3-5% strength HCl) fracture or oil fracture should be used. Solubilities greater than 10% indicate that the greatest stimulation will be achieved by use of a retarded type of acid fracture.

Consideration to the per cent of solubility is still necessary because the method of breaking the structure of a gelled acid and destruction of a normal emulsified acid is reaction with the rock. If less than 40% of the rock is soluble, a normal emulsion or gel will not break within a nominal period of time.

An emulsified acid should be used for the 10 to 40% solubility range which contains an internal breaker to assure the reduction of the treating-fluid viscosity and to derive the maximum benefit from the acid. If the solubility is greater than 40% a conventional emulsified acid may be used.

The Manning has been oil fractured with volumes from 4,000 to 40,000 gal. at rates from 5 to 60 bbl. per minute. Three wells have been fractured with large volumes at high rates and three wells have been treated with modest volumes and rates. The success of the large treatments is markedly superior to the small treatments. Fluid-loss additives were not used on these treatments because the operators felt that the porosity and permeability were low enough to preclude their use. The success is directly related to the injection rate as shown by fracture area calculations.

Generally, the volume of treatment applied to the Manning is in relation to the natural potential of the well. The better wells receive lighter treatments and weak wells are treated heavy.

Some problems have developed with fracture sand returning into the well bore after treatment. Besides hindering production it prevents insertion of the tubing through the production packer for dually completing in the lower Meramec. Use of the emulsified acid in preference to oil or gelled acid has done a great deal to eliminate this problem.

Another problem of dually completing in the Manning and Meramec, especially in 19n-6w, is that of communication between the two zones. Cement channeling has occurred and been confirmed by tracer survey work on two wells in East Hennessey field of 19n-6w. Cement squeeze and retreatment on the initial well resulted in improved production.

In the second instance a tracer survey was taken and the channel located and squeezed prior to treatment. A packer shoe was used on the bottom of the casing string on both wells. A latex cement application around the casing shoe was successful in achieving separation in a recently completed well in 15-19n-6w. Radioactive sand was used in the treatment and traced with a gamma-ray log after completion to confirm the successful operation.

The North Dover area in 18n-7w has a Manning-Oswego dual comple-

tion but no communication problem developed. There is considerable section (350±) between these formation tops.

Two slim-hole completions have been made to date in the Manning, one in Section 14 and one in Section 15 of 18n-7w. Two-and-seven-eighths-inch EUE tubing was used with the pipe set through and perforated. One came in natural after a small acid wash for 396 bbl. per day. The other was given a fracture treatment with retarded acid and potentialed for 702 bbl. per day. No attempt at dually completing these was made.

Formation Character: Meramec

The Meramec section is generally a dark-gray-to-brown, dense, amorphous lime. The section is vertically and horizontally fractured and these fractures represent the reservoir and establish the drainage pattern for migration of oil into the well bore. Matrix porosity is quite low in the range of 1 to 5%. Permeability of the matrix is also very low with a range of 0.01 to 0.08 md. of vertical and horizontal permeability reported through 68 ft. of core from 21-19n-6w. This well was fracture treated and potentialed for 96 bbl. of oil per day. Potentials range from 58 bbl. per day to 294 bbl. in 6 hours.

As little as 10 ft. and as much as 80 ft. may be opened and to date all have required stimulation. Open-hole completions are favored but there appears to be no correlation between completion methods and potentials. Solubility of the lime can be low because of heavy contamination of sand traces and finely divided shale. One section tested has a solubility of 44%. Reaction time was 5 minutes which is normal for lime in hydrochloric acid with sand, shale, and anhydrite insolubles.

The retarded acid treatment has been successfully applied to the Meramec as well as conventional acid stimulation and oil fracture. In engineering a stimulation treatment for the Meramec, consideration for the dense nature of the matrix is of primary importance. This density will result in the majority of any fluid staying in the formation fractures. Very little bleedoff will occur and the volume of treatment will be conducted out through the fracture system. Acid action will reduce the constriction of the fracture system and will afford a propping effect without any reduction in fracture permeability.

The acid should be of the retarded type, i.e., gelled or emulsified, and the injection rate should be high. Volumes used range from 10,000 to 50,000 gal. and sand concentrations are ½ to 1 lb. per gal. Injection rates are around 30 bbl. per minute and the current thinking is that this rate is necessary to force as many of the native fractures open and allow the deposit of sand in order to establish as much drainage pattern as possible.

Sand return to the well bore is a problem in the Meramec and care should be taken when removing pressure after treatment to prevent surging sand out of the formation back into the well bore. This is true for oil fracture or retarded acid fracture.

Oil fracture in large volumes and at high rates is becoming more popular for stimulating the Meramec because it is successful and meets the requirements on an engineered approach to treatment. The oil is lease oil and therefore compatible with the formation oil. Injection is down the casing at increasingly higher rates with each treatment performed. Fluid-loss additives have not been used because of the high rates and the low permeability and porosity of the matrix rock. A sand concentration of 2 lb. per gal. is used. The oil fracture also reduces the cost of stimulating the Meramec because the oil is salable after recovery.

Table 3 gives an indication of the treatments and results.

TABLE 2—FRACTURE TREATMENTS IN THE MANNING

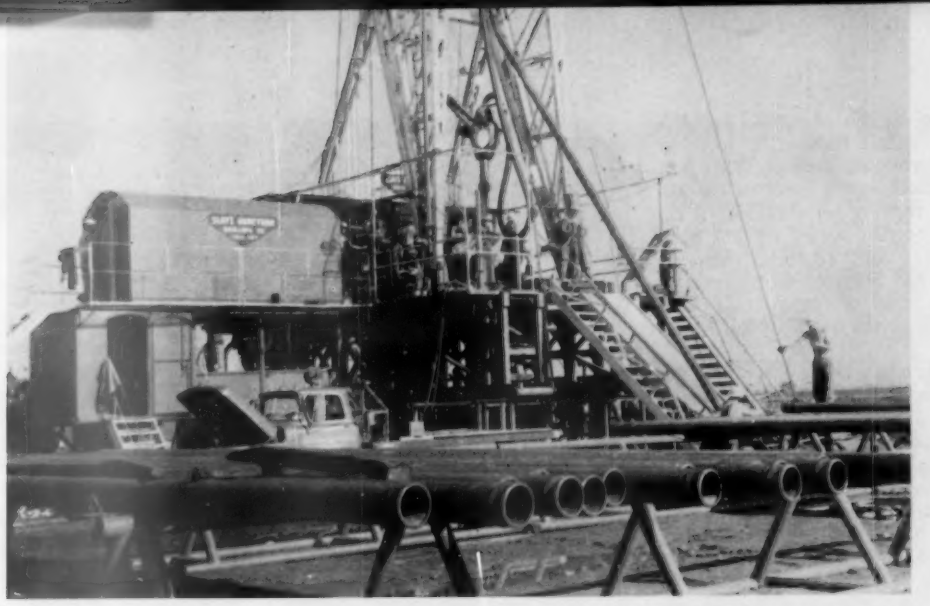
Section	Operator	Lease	No.	Prod.	No. hours	64th ck. size	Tubing press. (lb.)	Bbl./hr.	Treatment	Inj. rate (bbl./minute)
14-18-7	Jones & Pellow	Bradbury	1	144	24	16	500	6	Oil with 1 lb. sand	5.6
14-18-7	Jones & Pellow	Crossley	1	60	6	18	800	10	Emulsified acid with breaker	24
11-19-7	Humble	Huntsberger	1	Gas	24	20	1,125	*2.13	Emulsified acid	9
1-19-6	Marion Oil	Cooper	1	78	6	20	300	13	Emulsified acid with breaker	17.2
10-19-6	Jones & Pellow	Kincade	1	104	10	18	350	10.4	500 gal. mud acid	3
14-19-6	Jones & Pellow	Gabriel	1	150	10	24	500	15	Emulsified acid	11.8
15-19-6	El Paso Prod.	Gritz	1	72	24	16	200	3	Oil with ½ lb. sand	24.2
15-19-6	Jones & Pellow	Schimanek	2-B	310	6	20	400	51.6	Oil with ¼ lb. sand	8.2

*In millions of cubic feet per day, with 18 bbl. per day of distillate.

TABLE 3—FRACTURE TREATMENTS IN THE MISSISSIPPIAN (MERAMEC)

Section	Operator	Lease	No.	Prod.	No. hours	64th ck. size	Tubing press. (lb.)	Bbl./hr.	Treatment	Inj. rate (bbl./minute)
11-19-7	Humble	Huntsberger	1	Gas	24	16	2,080	*2.7	Emulsified acid	24
10-19-6	Jones & Pellow	Kincade	1	90	10	16	650	9	Gelled acid	26.6
11-19-6	El Paso Prod.	F. Will	1	348	6	25	950	58	Oil with ½ lb. sand	40.1
11-19-6	El Paso Prod.	F. Will	2	163	6	25	425	27	Oil with ½ lb. sand	60
14-19-6	Jones & Pellow	Gabriel	1	108	24	16	275	4.5	Emulsified acid with breaker	32.0
15-19-6	El Paso Prod.	Gritz	1	288	6	28	375	48	Oil with ½ lb. sand	50
15-19-6	Jones & Pallow	Schimanek	2-B	420	6	20	700	70	Oil with ½ lb. sand	21.8
16-19-6	Jones & Pellow	Schimanek	1-C	216	12	16	600	18	Emulsified acid with breaker	25.0

*In millions of cubic feet per day, with 68 bbl. distillate per day.



CASING BEING RUN in an El Paso well in East Hennessey field, Oklahoma. This is the first step in a new technique in which . . .

Kingfisher wells are completed with air

Initial potentials are better with air as a fluid than with a conventional mud completion. Dual wells are popular and have been made easier to complete with the development of a new perforating gun. Here are the details of this new completion program.

BY CHARLES M. COLE

. . . division engineer for El Paso Natural Gas Products Co., Midland, Tex. He transferred to this position from El Paso Natural Gas Co. in 1957. A graduate of Texas Technological College, he has served as petroleum engineer for Aztec Oil & Gas Co., and as gas engineer for El Paso.

FIRST COMPLETIONS in East Hennessey field showed that conventional drilling mud was damaging the producing formations. And the potentials of otherwise good wells were less than desirable. After reviewing all the completion problems, El Paso Natural Gas Products Co. engineers have developed a procedure that yields excellent results.

All except 1 of the 19 completed wells in East Hennessey pool are dually completed. The upper pay is the Manning at a depth of about 6,500 ft.; the lower is the Meramec at around 6,700 ft. Three to five rotary rigs have been active in the field during the past few months.

The pay zones. The Manning is a sand or limy sand with a thickness from 15 to 40 ft. Many of the Manning wells have good permeability and porosity, and were completed naturally with no stimulation necessary. The Meramec is much thicker, but the majority of the wells are completed in the upper portion of the pay only. The Meramec is primarily a fractured sandy lime, and some type of stimulation is generally required.

Both pays produce oil of about 40° API gravity. As the pool appears to be a stratigraphic - type reservoir, structural location of the wells is secondary to permeability and porosity development.

Drilling problems. With the exception of spotted severe loss of circulation, drilling in the area presents no particular problems. Water or native mud is used to about 4,000 ft. where viscosity control is started. From about 5,200 ft. to total depth water-loss control is provided by use of a gel-chemical mud system. Pretreatment with lost-circulation material at a depth of 5,500 ft. has proved advisable as there are possible lost-circulation zones from there to total depth.

Excluding time for drill-stem tests and cores, about 21 days are required to drill to the top of the Meramec formation using an average of 19 rock bits.

Completion problems. Experience of other operators in the field showed that there were several completion problems in the pool. Foremost was the damage done by mud lost into the fractured Meramec formation when it was drilled by conventional rotary methods. Some wells in the field had been drilled into the Meramec with casing set through and perforated, while others had drilled in with mud and set casing at the top of the Meramec with a packer shoe.

On several wells, casing was set

at the top of the Meramec and the pay was drilled with cable tools to prevent formation damage. This is a good method, but it involves the expense of moving in a cable-tool rig after the regular rotary rig has been moved off. And additional time is required for completion because of the slow rate of penetration with cable tools at the depth of the Meramec.

Good primary cement jobs on the production casing had also been a problem due to loss of circulation and channeling when the cement was pumped up the annulus. Another problem was the fact that oil did not provide enough hydrostatic head to control the formation pressures when completing the wells. Loading the wells with water or mud appeared to damage the producing formations. Some wells loaded with oil had pressured up and flowed naturally after perforating with casing guns, making running of tubing difficult unless water was pumped into the well. The use of expendable through-tubing perforating guns presented the problem of junk falling on top of the permanent packer which is generally set between the two producing zones.

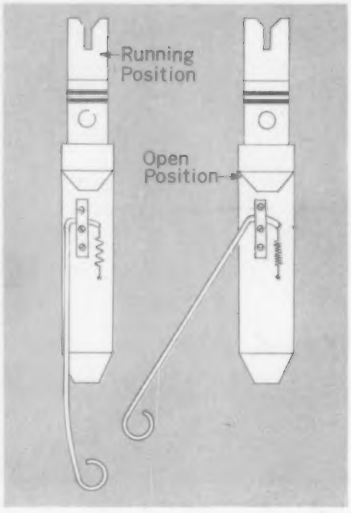
In an effort to solve or minimize these problems, El Paso Natural Gas Products has worked out a completion program which we feel meets all requirements. And it results in better quality wells at low cost. Two major innovations are the drilling of the Meramec with rotary tools using air to circulate the hole, and a procedure for perforating the Manning which allows the well pressures to be controlled at all times, even with oil in the hole. Another deviation from general practice in the field has been to run two parallel strings of tubing in the well rather than using the tubing-casing annulus for flowing the Manning. We feel that producing the Manning through tubing will definitely prolong the flowing life of the well and make any future installation of pumping equipment easier.

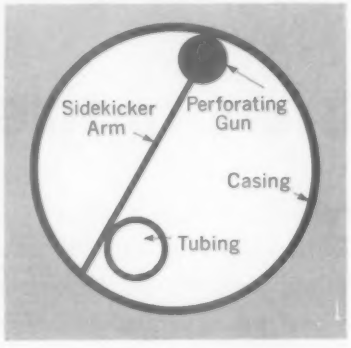
Three dual wells have been drilled and completed by our company, and the fourth well is being drilled. Our completion program was developed with these three wells, and with only minor differences it was the program used on all three.

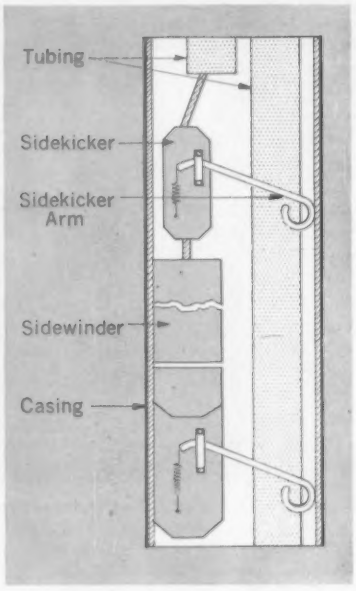
New technique. After drilling the wells by conventional rotary methods to the casing point at the top of the Meramec, 7-in. casing was run. That size of casing allows two parallel strings of 2⅜-in. EUE tubing to be run. Particular attention has been given to the cementing of the 7-in. casing and has resulted in successful jobs on the three wells. Rotary scratchers were used at intervals from the bottom of the casing to a point above the Manning in an attempt to prevent channeling of the cement. Centralizers were used up to the anticipated top of the cement. To regular cement with 4% gel, an additive (Strata-Crete 6) was mixed at the rate of ½ cu. ft. per sack of cement. This additive makes the resulting slurry lighter in weight, and it has bridging properties which help maintain circulation during the cementing operation. In the last portion of the cement slurry, liquid latex has been added at the rate of 1½ gal. per sack of cement so as to obtain a better-quality cement at the casing shoe. Circulation was maintained on all three jobs, and the cement tops by temperature surveys have checked very well with what was anticipated.

While waiting on cement to cure, a blowout preventer and a rotating drilling head were rigged up for air drilling. A 6⅛-in. hard-formation-type rock bit was run on twelve 4¼-in. drill collars with tubing used as the drill string. When the cement was cured, the plug in the casing was drilled using water for circulating the hole. When the plug had been drilled to the casing shoe, the water in the hole was unloaded with air. This was done by injecting air at the standpipe into water that was being circulated by the rig pump. This air was supplied by leased compressors which were capable of delivering about 900 c.f.m. up to pressures of 1,350 psi. Once enough of the water and air mixture has been circulated to lighten the hydrostatic head in the annulus, it becomes possible to stop the rig pump and continue circulating the hole with only air from the compressors. A soap solution injected with the air forms a foam and helps in unloading the hole.

With the hole unloaded, drilling the Meramec formation below the casing shoe was started using air to circulate the hole. The same amount of air used to unload the hole was used to drill; however, the pressure required at the standpipe has been only 275 psi. Water with a soap solution added has been injected into the air stream at a rate of 5 bbl. pre hour to keep formation cuttings from "balling up" or sticking to the inside of the casing.







HOW SIDEWINDER and sidekicker operate. Sidekicker arms force the perforating gun against the casing, avoiding any loss in energy due to "stand-off," and also align the gun so that there is no danger of perforating the adjacent string of tubing.

"... economically solves problem of contamination ... by mud."

During the air-drilling operation, the return air and cuttings were blown to the reserve pit through a 4-in. line which is connected to the well just below the rotating drilling head. The three wells completed have had sections of 96, 90, and 60 ft. drilled into the Meramec formation using air to circulate. The average rate of penetration in drilling these wells has been 5.3 ft. per hour. One bit was required for the last two wells, while two were required to drill the 96-ft. section. This is much faster than could be expected by drilling the same sections with cable tools.

Meramec fractured. After drilling the desired interval in the Meramec, approximately 90 ft., the hole was loaded with oil and the drill string pulled from the well. A gamma ray-neutron log was run. Then the open-hole section of the Meramec was fracture-treated down the 7-in. casing with 40,000 gal. of lease oil and 20,000 lb. of 20-40 mesh sand. Treating pressure was near 1,200 psi. Shut-in pressures after the fracture treatment generally level off about 300 psi. Before recovering any of the load oil, a permanent packer is set in the casing above the Meramec formation.

Because of the pressure after fracture treatment it has been necessary to use a full lubricator to run this packer. Once the packer is set, the pressure can be released from the wellhead as a flapper valve in the packer will retain the pressure below the packer.

Two parallel strings of 2⅜-in. EUE tubing have been used in the three completed wells. The shorter string which hangs free about 40 ft. above the Manning has had the coupling beveled and turned down to an outside diameter of 2.910 in. The long string for producing the Meramec is run with a locator seal assembly which sets into the permanent packer separating the two pay zones. Although there is no pressure at the wellhead while running these strings of tubing, except for the time needed to land the seal assembly in the packer, offset rams are used as a safety precaution in case a leak should develop in the packer or the flapper valve. By use of a "stripper" head with an offset spool arrangement in connection with the blowout preventer, it is possible to land the tubing on doughnut hangers and maintain complete control over the well at all times.

Perforating the casing opposite the Manning zone has been done by landing both strings of tubing immediately above the Manning zone and going through the long string with the perforating gun and out into the 7-in. casing. At the time of perforating, the shorter string of tubing is permanently landed, while the long string is temporarily landed with a blowout preventer and "stripper" head in place so that it can later be run to bottom and set into the permanent packer.

The perforating gun used for this job is a jet gun with the charges inside a 1½-in. steel tube. The charges are arranged so that they all shoot in the same direction. This small gun, which is named the Sidewinder, was developed by Jet Research Center, Inc., and it is used in connection with a mechanical decentralizer that has been developed by Welex, Inc. The decentralizer serves to push the perforating gun against the casing with all the charges pointing in the proper direction. This reduction of "standoff" distance apparently enables the small jet charges to be most effective.

TABLE 1—COMPARISON BETWEEN THE WELLS COMPLETED BY AIR AND BY OTHER METHODS

(Initial potential, barrels per day)

Wells Completed with Air

Co. and well—	Meramec	Manning
El Paso		
No. 1	1,152	72
No. 2	1,380	272
No. 3	653	741
El Paso avg.	1,061.7	361.7
Company "A"		
No. 1	890	312
Air drilled avg.	1,018.8	349.3

Wells Completed by Other Means

Company "B"		
No. 1	388	432
No. 2	492	360
No. 3	259	180
No. 4	216	249
No. 5	108	360
No. 6	1,176	208
No. 7	432	390
No. 8	176	90
No. 9	210	280
No. 10	1,680	1,240
Company "C"		
No. 1	152	90
Company "D"		
No. 1	72	240
No. 2	96	720
Company "E"		
No. 1	204	2
Average	404.4	343.4

After completing the perforating, the long string of tubing is run on to bottom and seal assembly is set into the permanent packer. No debris results from perforating with this gun, as it is all enclosed in the steel tube carrier; therefore, no difficulty has been experienced in landing the seal assembly into the packer. Perforations from this small gun have been very satisfactory, as two of four wells have flowed naturally from the Manning, and the other two required breakdown pressures of only 1,600 and 1,300 psi. when performing acid treatments.

After perforating the Manning, the drilling rig is no longer needed. Load oil from the fracture treatment of the Meramec can be recovered and that zone tested. If the Manning will flow, it can be tested, or should it need swabbing or treatment, a pulling unit can be moved on. Completion of the last well required less than 3 days' rig time after drilling of the cement plug was started. Included in the 3 days' work were drilling and fracturing the Meramec, setting a packer, running two strings of tubing, and perforating the Manning. As neither of the zones required swabbing, a well-servicing unit was not required during the completion.

Conclusions. It is felt that this program offers a good solution to the special completion problems in the East Hennessey wells. The use of air for drilling the Meramec formation economically solves the problem of contamination of the formation by drilling mud. One other operator in the field has used air for drilling the Meramec. That well, along with the three completed by El Paso, have average potentials of 1,019 bbl. of oil per day from the Meramec formation. This compares with 404 bbl. of oil per day which is the average of the potentials for 14 other wells completed in the Meramec by all other methods, including those drilled in with cable tools. We feel that the increase in average potential is largely due to the fact that air drilling does not contaminate the fractured pay zone. The use of air makes it easier and more economical to drill more of the Meramec, which could definitely increase the recoverable reserves.

The relatively short rig time required in completing dual wells in East Hennessey pool by the above procedure makes the operation economically attractive, and in addition all indications are that this procedure results in better-quality wells than those completed by other methods.

Split traveling block speeds up tubing jobs by 50%

Here's a new application of an old principle. Its patent holder, Skytop Rig Co., believes the split-block idea may eventually be used in handling drill pipe for large drilling rigs.

BY ED McGHEE
Drilling Editor

DID YOU EVER SEE a pole-mast-type well-servicing unit run tubing singles at the rate of four per minute? And pull three singles per minute?

You probably haven't unless you've seen such a unit fitted with a split-traveling-block system.

Running four joints per minute and pulling three are speeds worthy of many well-servicing units which handle two-joint stands—doubles—of oil-well tubing. Yet, these are not unusual speeds for a moderately experienced crew working under a gin pole which pulls only single joints of tubing but which uses the new open-face traveling-block method.

Moreover, the speed comes smoothly. There's no danger of injury to the crewmen involved. They do not become unduly fatigued.

Well-service crews which have also worked under doubles masts and conventional singles masts say that the new system is no more difficult to operate than the older ones. And these men say this: If the crew of a conventional doubles unit stops for a smoke, the unit equipped with the split-block system will pull a string of tubing faster.

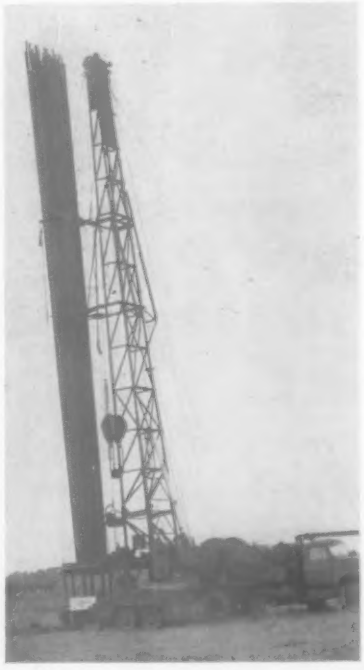
Doing two things at once. Secret of the new system is in condensing the sequence of operations in handling tubing. You might compare it to the gain in power that a two-cycle engine makes over a four-cycle. The two-cycle engine combines power and exhaust strokes into one; it also combines intake and compression strokes. Thus, the two-cycle engine has a power pulse every revolution while the four-cycle design's power surge comes only once every second revolution.

As a result the two-cycle engine has greater horsepower per pound than does a four-cycle.

Think of the conventional tubing-handling methods as the four-cycle system. When such a unit pulls tubing, the elevators must come to rest at the top of the mast as each joint is pulled. This joint must be held stationary in the elevators while it is unscrewed on the floor and, then, racked. Only after this can the elevators and traveling block be let down to the floor to pick up the next joint.

Now compare the split-block method to the two-cycle-engine design. In this system when the elevators arrive at the top of the mast they don't stop to hold the joint; they immediately slide back down that joint as power tongs unscrew it. And when that joint is unscrewed it need not be held by the elevators while it is set back; this job is done by a small transfer hoist.

As a result, the elevators spend 100% of their time in their primary job—pulling the string. That is, the elevators move smoothly up and down without a time-wasting pause at the top of the stroke to hold a joint. Movement of the blocks is only a little less rhythmical than the polished rod of a pumping unit.



PULLING DOUBLES, racking singles is operation of this well-service unit on which the traveling-block system was first used.

The same comparison works when the tubing is run back into the hole. The four-cycle conventional unit picks up a new joint with the elevators. Then the elevators must hold this new joint as it is made up with the tongs.

Not so with the two-cycle split-block system. The elevators don't pick up the new joints. This is done by the same transfer hoist used in pulling pipe. While the new joint is made up by the tongs, the elevators are moving up that joint so that the string may be lifted off the slips immediately and lowered into the hole without time loss.

By compressing tubing-handling time in this manner, the split-block system regularly runs and pulls tubing strings about 50% faster than do conventional singles units.

Making a Trip

For details of how the split-block kit functions, let's follow a crew of Spears Well Service, Inc., of Victoria, Tex., as they make a round trip with the tubing string. Spears has several units equipped with the new system, but the one pictured here has a pole mast and a 10-year-old draw works. Except for the split-block items, the rig is the same as it has always been during the years it pulled wells in the conventional manner.

For ease of understanding, we'll watch the trip into the hole first.

Running the pipe. As in the step-by-step pictures on these pages, we start the cycle as the elevators are lowering the tubing into the hole after a joint has been added to the string. While the traveling block and elevators are descending, the derrick man puts his transfer elevator on the next joint to be added.

Down on the derrick floor, one of the floormen operates the controls on the transfer hoist to pick up the new joint. By the time the elevators reach the floor, the new joint has been picked up into the air.

When the elevators get close to the

floor, the unit operator applies his brake and the slips are set to suspend the tubing string in the usual way. Notice now, however, that the elevators are not released immediately. Instead, one of the floormen quickly swings the new joint over and stabs it into the collar protruding from the elevators. But this new joint is not made up into the collar immediately.

Rather, the same floorman now hits the hand release on the elevators that allows them to slip over the collar under which they'd been latched. At this, the driller starts the blocks and elevators back up into the derrick. During this upward trip the elevators don't swing free; they ride up around that new tubing joint.

As the elevators clear the floor, the crewmen put the power tongs on the new joint and make it up into the string. Meanwhile the elevators continue upward at moderate speed; there's no need to race the draw works (which can cause damage) because the elevator need not reach the top of the joint until the tongs have made it up.

When the elevators reach the collar at the top of the new joint, they latch under it. No hand tripping is necessary for the elevators in the derrick; reason is that they reset automatically as they slip over the collar at the floor.

The unit operator then lifts the string so that the slips can be pulled out; and then the pipe is started downward again to recommence the cycle.

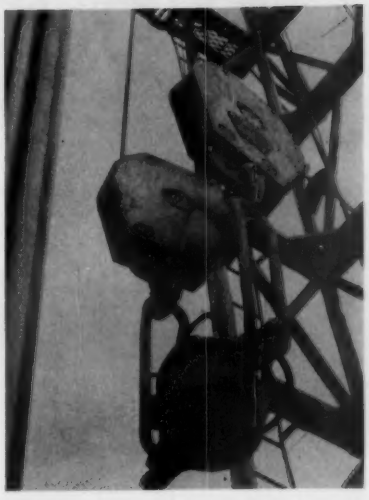
Notice that nowhere in this cycle of operations did we mention the derrick man latching the elevators on the fly

It's easily installed

THE SPLIT-BLOCK layout can be easily installed on most single-type well-servicing units now in the field. Cost is moderate. The investment should be returned quickly in time saved on round trips with the tubing. Actually, no particular item of the equipment is especially new. Rather, the newness lies in assembling the individual pieces into their present form for the first time.

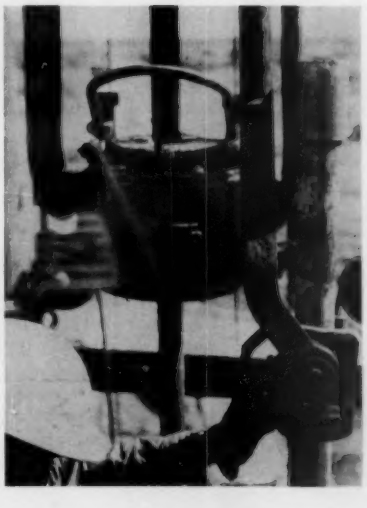
Idea for the system belongs to Skytop Rig Co., of Victoria, Tex., which holds patents on the split, or open-faced, traveling block. This is the same block the company uses for its drilling and service unit which pulls singles but racks doubles. The complete split-traveling block system is available from Skytop in kit form to fit most other companies' single rigs. Major items in the kit are shown at right.

Here's the equipment needed



1. The split block. Viewed from the top, the traveling block is U-shaped. A completely separate sheave forms each leg of the U. Bottom of the U is a rigid steel member which joins the two sheaves. This U is a channel into which a joint of tubing may be laid, or through which the tubing may pass lengthwise. Thus, the block may be lowered all the way to the floor even though a complete joint of tubing is sticking up above the slips.

2. The cylindrical elevators. These elevators latch under tubing collars in the same manner as conventional elevators. However, the cylindrical design does not hinge on the side; thus it cannot slip off the pipe. Instead, the elevator rides up and down a tubing joint as a finger ring might slide up and down a pencil. A hand release on the elevators allows tubing collars to pass through when necessary.



3. Transfer hoist and transfer elevators. Because the transfer hoist handles only singles of tubing it requires little power. In fact, it is usually operated off the power oil supply for the power tongs and does not interfere with operation of the tongs. The transfer hoist is quite similar to that used to handle sucker rods in the mast when a rod basket and transfer are used. The transfer elevators are nonlatching and easily engaged and disengaged. These transfer elevators are the only equipment handled by the derrick man since he does not latch and unlatch the main elevators in the usual fashion.

Crown block is the same as on conventional rigups. So are the slips that suspend the string in the rotary table. All driller's controls are the same as with any other system. Power tongs, already in near-universal use, are required for good results.

as he must with conventional pipe-handling systems. The derrick man has no occasion to touch the elevator ever; his almost sole purpose is to transfer the tubing from the racking board to the well position. Sometimes, however, he may steady each new joint of tubing as the elevator rides up it; this is not always necessary.

As a result, the derrick man in the new system has the safest and easiest job on the rig. Contrast this with the old system where he faces the hazard of latching and unlatching rapidly moving elevators.

Pulling the string. Essentially, the trip out of the hole is merely the reverse of the trip in. On the trip out, the derrick man may "dope" the tubing collars since he has ample time to do so.

When a joint of pipe has been pulled from the well, and the slips have been set, the driller immediately starts lowering the elevators back to the floor. There's no need to wait as in the old system.

As the elevators slide down the joint at a controlled speed, the power tongs unscrew that joint. By the time the elevators reach the floor the tongs have done their work and have been pushed back out of the way.

The just-unscrewed joint is not swung away. Instead, the elevators continue down this joint, over the collar below, there to latch. Of course, one of the floormen trips the hand release as it nears the floor so that the elevators can slip down over the collar.

At the same time that the elevator passes the collar, the derrick man is picking up (with the transfer hoist) the joint just unscrewed. As this joint is set back in the pipe rack, the unit operator simultaneously starts hoisting the next stand. Thus begins another cycle.

Variations on a theme. To many well-service men, the split block is familiar in another application. It is the same general system used by the patent holder, Skytop Rig Co., of Victoria, Tex., to make possible racking two-joint stands of tubing in a singles mast. With such a rig the pipe is pulled in singles, with the second joint of each double protruding up through the traveling block and crown block as well.

Skytop officials do not feel that they have reached the limits for the split-block principle. They believe it may eventually be used in handling drill pipe for large drilling rigs. And, they say, there may be even more applications.

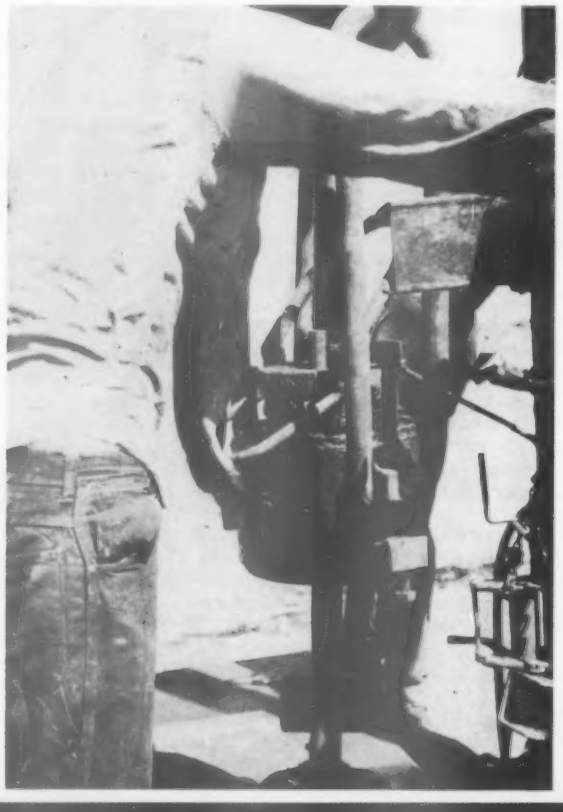
Split Traveling Block Speeds Tubing Jobs —starts p. 100

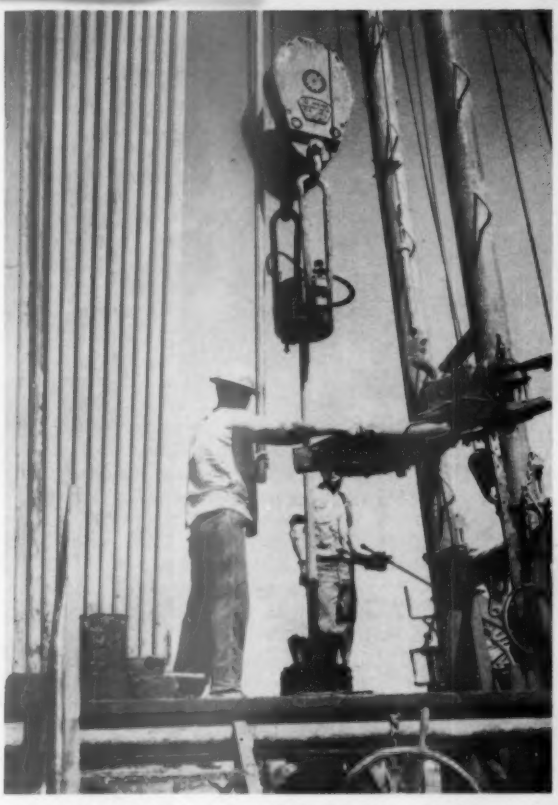
Picture sequence

Going in the hole . . . step by step

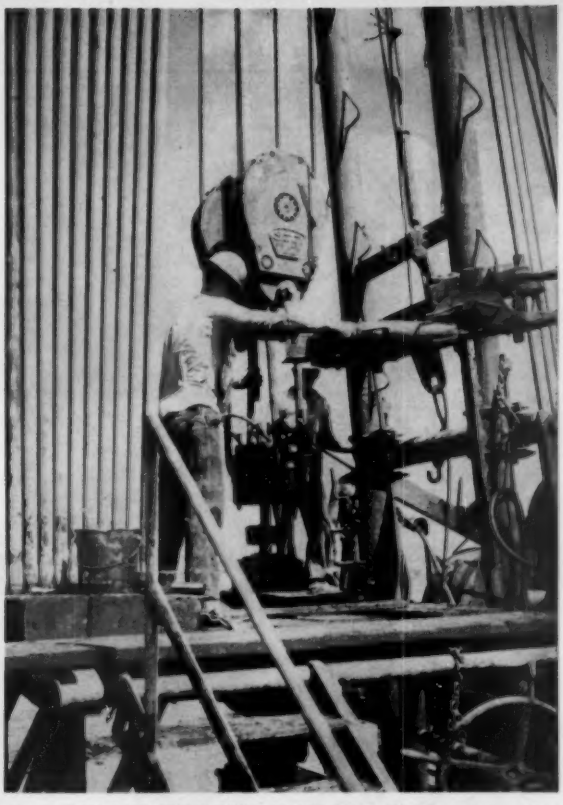
1 TRAVELING BLOCK FALLS as the tubing string is lowered into the hole. While the block descends, the derrick man puts his transfer elevators on the next joint of tubing, getting that joint ready to add to string.

4 NEW JOINT IS STABBED INTO STRING as the elevators and block remain at rest for a few seconds. This is the only pause in the smooth reciprocation of the elevators up and down the string. While the new joint is being stabbed, second floorman is preparing to put power tongs on pipe.





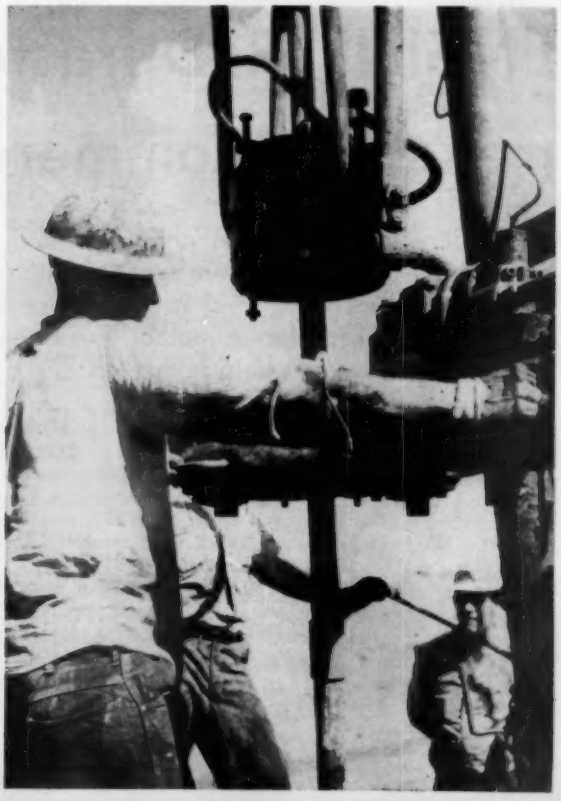
2 FLOORMAN GETS NEXT JOINT READY as block and elevators near the floor. This joint has just been picked up with the transfer hoist which is being operated by the floorman in the background. Unit operator is not visible.

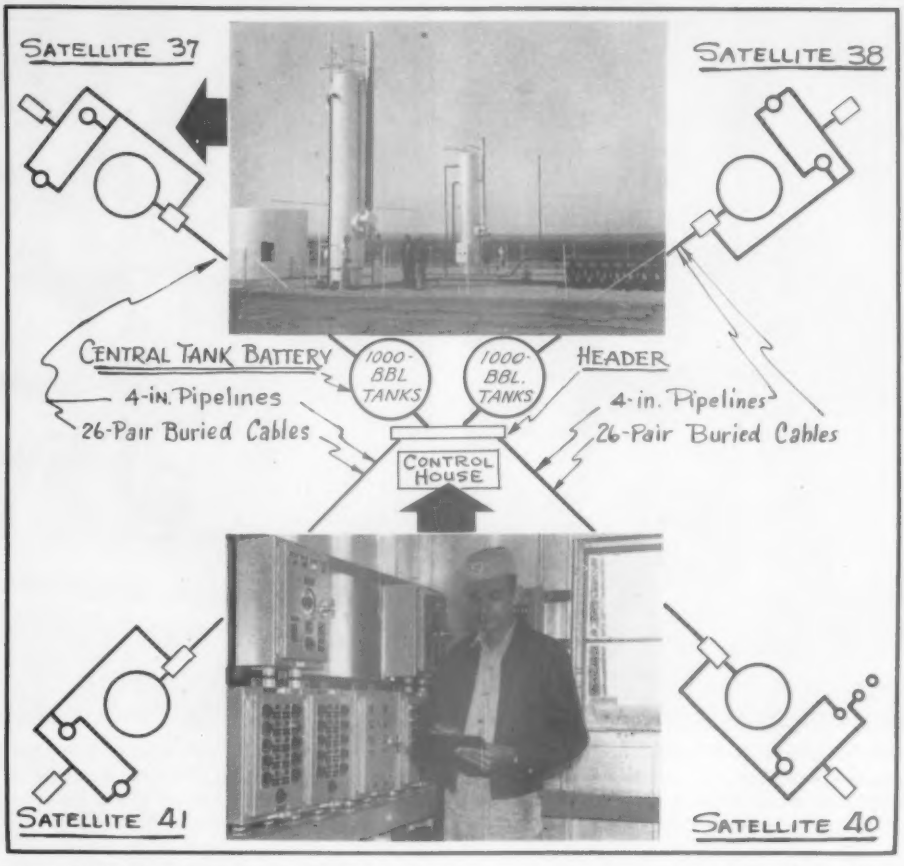


3 BLOCK AND ELEVATORS COME TO A STOP and the slips are set on the string. Then the floorman swings the new joint over inside the U-shaped block, preparing to stab into the collar under which the cylindrical elevators are latched.

5 ELEVATOR RELEASE IS TRIPPED by the floorman so that the elevators will pass over the collar under which they have been latched. Now the elevators are free to ride over the collar and on up the new joint. Passing over collar resets hand release.

6 ELEVATORS START BACK UP the pipe while power tongs are being put on that new joint to make it up into the string. By time elevators reach top of joint, the tongs will have made it up tight and floormen will be ready to pull slips and start cycle all over again.





AFTER BEING PUT on a commercial basis, Sacatosa field was completely automated. Shown here is the layout of a basic four-section unit. It has one central control battery where the total fluid from the four satellite batteries is separated, stored, and metered. All controls for the satellites and the central battery are located at the central control panel, lower inset. At top is shown one of the satellite installations.

ENGINEERED fracture treatments make "noncommercial" field pay off

• Conoco well-completion engineers and research teams have made a commercial venture out of unprofitable Sacatosa field in South Texas. Large-volume sand-oil fracturing method has been applied successfully to put the field in the black.

BY RONALD CASEY AND JAMES C. SHEPLER
Continental Oil Co., Driscoll, Tex.

"NONCOMMERCIAL!" cried several major operators after taking a look at the potentialities of the N. J. Chittim lease.

Sure, conditions looked favorable under the 200,000-acre Chittim Ranch in Maverick, Dimmit, and Zavala counties of South Texas, but commercial production was never found by those drilling the exploratory wells.

Then Continental Oil Co. came along, picking up a 145,378 acre lease in 1954, and the field soon took on a commercial look.

Lots of wells, lots of sand. Continental engineers found that large-volume sand-oil fracture treatments would make the wells produce, and more than 190 have been drilled so far. And they are still being drilled, at the rate of one well every 2 days. Up to 135,000 lb. of sand and 60,000 gal. of crude oil and Adomite are used in fracturing each well.

Continental expects to have more than 250 wells producing before the end of the year.

Geology and exploration. Regional structure is the broad southeast-trending anticline known as Chittim arch. Aerial surveys of this area showed a surface fault in the central portion of the lease. This was the basis on which the initial test was drilled in April 1955. The test resulted in production from the Eagle Ford shale, which potentialed 103 bbl. per day in open hole from 3,109 to 4,134 ft.

Later in the year two dry offsets were drilled.

An extensive stratigraphic test program was initiated in the spring of 1956. The drilling of 14 wells, varying in depth from 1,390 to 4,047 ft., provided the structural and stratigraphic control necessary for further evaluation of the lease. One of these stratigraphic tests was completed as a gas well in the Plumly field and five others defined the San Miguel sand reservoir, which at that time was not known to be of commercial significance. As a result of this program, five wells were drilled during the fall of 1956 and spring of 1957. Of these, four were dry and one was completed as the discovery well of the Sacatosa (San Miguel-1 sand) field.

The San Miguel-1 sand is a member of the Taylor formation of the Upper Cretaceous system of Mesozoic age. This reservoir, defined by the test programs, is a stratigraphic trap resulting from a sand pinchout, or truncation, across the arch. It dips structurally at an average rate of 140 ft. per mile to an oil-water contact.

The maximum gross thickness of this sand section is approximately 80 ft. at the oil-water contact, but the net pay averaging 22 ft. is in the upper 25 to 40 ft. of the section. Within the pay section, there are limy or hard streaks ranging from ½ to 4 ft. in thickness.

Development. The discovery well, No. 37-6, was drilled and cored with air. Only a small amount of unconsolidated sand was recovered by coring. This well had a pumping potential of 4 bbl. per day on December 5, 1956, but after shooting with solid nitroglycerin, it produced 6 bbl. per day.

Because of the marginal status of this well, a study was made before deciding on a program to evaluate the commercial possibilities of the sand. The program selected called for the immediate drilling and testing of two additional wells, using special drilling mud, coring, logging, and completion methods.

Wells 37-10 and 37-11 were drilled and completed in the spring of 1957. Well 37-10 was fractured with 22,500 lb. of sand in 16,590 gal. diesel oil and potentialed 19 bbl. by pump. Three months later the well was perforated higher in the section and fractured with 75,000 lb. sand in 51,240 gal. diesel oil. It potentialed 60 bbl. of oil, flowing on a 11/64-in. choke.

Well 37-11 was fractured with 90,000 lb. sand in 67,000 gal. diesel oil. The well potentialed 58 bbl. of oil flowing on a 8/64-in. choke.

TABLE 1

Well	Perf. interval	Lb. sand	Initial potential
5-1	1,326	30,000	72 bbl. of oil per day, 11/64-in. choke, tubing pressure 230 psi.
37-1	1,349	270,000	109 bbl. of oil per day, 15/64-in. choke, tubing pressure 110 psi.
42-1	1,406	90,000	121 bbl. of oil per day, 16/64-in. choke, tubing pressure 140 psi.
42-2	1,440	90,000	23 bbl. of oil per day by pump
100-1	1,524	30,000	Dry hole
100-2	1,673	90,000	102 bbl. of oil per day, 13/64-in. choke, tubing pressure 140 psi.

The performance of these three wells in the San Miguel-1 sand was studied for a year. During this time, Continental's research and development department participated in an extensive study to work out a further program for evaluating the field. This program called for the drilling of six wells, using various completion practices in an attempt to determine the economics of further development and to evaluate the various sizes of fracture treatments.

Experimental wells. In August and September 1958, the six new wells were drilled and completed in the San Miguel-1. During the latter part of November and December, these six wells were perforated, fractured, and put on production. Table 1 shows the wells, fracture size, and initial potential. Sand concentration is 1½ lb. per gallon.

On March 1, 1959, the Railroad Commission of Texas granted a 6-months' exemption status to permit the wells in this field to be produced at a rate sufficient to establish a performance trend in a reasonable length of time. This rate was the 20-acre depth allowable of 37 bbl. per day. Based on information obtained from these wells during this period, a computer reservoir study was made which indicated that the optimum fracture size was between 40,000 and 60,000 gal. with 1½ lb. of 20-40-mesh sand per gallon. The wells were perforated with single-plane guns.

Procedure standardized. The development of the N. J. Chittim lease has seen the formulation of standard drilling practices and completion techniques. Briefly, a 7⅞-in. hole is drilled to total depth without surface pipe, the well is logged, cased with 4½ or 5½-in. pipe cemented to surface, and perforated in a single plane for better fracture initiation. Tubing is then run, and the well is fractured and placed on production. Average well costs are shown in Table 2.

TABLE 2—COST PER WELL

Completed well cost	$17,000
Lift equipment	2,400
Automation	1,500
Electrification	450
Roads	150
Lease miscellaneous	500
	$22,000

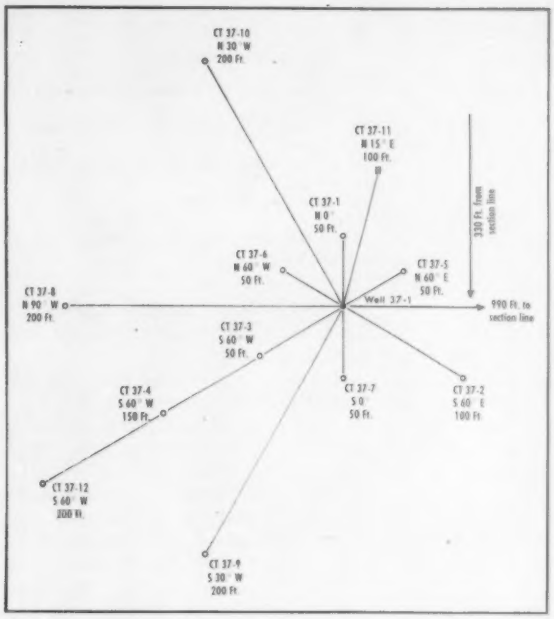
From 1½ to 2 bits are used per well depending upon depth. Rig time is from 24 to 48 hours from spudding in to release after setting casing. Well depths range from 1,300 to 1,900 ft.

Proper completion of a well depends on the log analysis. The logging program followed on the Chittim lease was derived from the evaluation of several types of logs to determine which combination would yield the most accurate formation data. This evaluation was made by comparing the results of core analysis with log computations. The practice now is to run an induction-electrical log and a MicroLog as soon as possible after drilling the well. This is done because the length of time the mud is on the formation face appears to affect the logging results. After the casing is cemented, the gamma ray-neutron log is run for depth correlation and perforation placement.

Further development of the lease made it necessary to study the logs carefully before setting the casing string. Another sand, the San Miguel-5, is below the San Miguel-1, and the possibility of dual completions is created. Five and one-half-inch casing is used in all wells with good development in both sands to permit dual completion. The drilling program is planned to check the development of lower sands. Various wells, designated by the geological section, are drilled to a sufficient depth to penetrate the lower sands.

The first wells drilled were completed using 5½-in. casing. It was necessary to use this size as the only single-plane perforating equipment available would not fit in smaller casing. As activity in the area increased, new ideas and equipment developed. The introduction of the eight-way jet made it possible to complete the wells using 4½-in. casing.

The eight-way jet is now being used to perforate the casing, except where formation breakdown cannot be obtained after perforating with jet charges. In the latter cases, the hydraulic perforation has been used and proven satisfactory. Perforation is in



THIS PLAT shows the locations of the core test holes drilled around well No. 37-1.

one plane to secure a single horizontal fracture.

Before fracturing, tubing is run so the well can be placed on production immediately following the fracture job. However, standard practice is to fracture down the annulus for higher pumping rates. A representative fracture job is as follows:

> Pump 30 bbl. blanket-lease crude treated with 0.10 lb. of Adomite per gal. to break down the formation and establish a pumping rate. Pump 131,500 lb. of 20-40-mesh angular sand and 3,500 lb. of 10-20-mesh sand as follows, using lease crude treated with 0.05 lb. of Adomite per gal.: Pump 5,000 gal. with 1½ lb. of sand per gal., 5,000 gal. with 2 lb. of sand per gal., 5,000 gal. with 2½ lb. per gal., and 33,800 gal. with 3 lb. of sand per gal. The 20-40-mesh sand is followed by 1,200 gal. with 3 lb. of 10-20-mesh angular sand per gal. to hold the fracture open and help eliminate the sand influx problem during the initial recovery of load oil from the well.

Following the fracture treatment the well is opened for production through a choke to control the return of sand from the fracture. Initial production rate after fracturing usually varies from 100 to 200 bbl. of oil per day.

Drilling fluid. A mud program has been developed through experimentation with various drilling fluids. The first well was drilled with air because, if a water-base mud was used, there was a tendency for the clay matrix in the sand to hydrate, causing a fluid block. Reservoir pressure was expected to be low and any obstacle to flow would lessen the chance of economic production. Further study and field application discovered that a phosphate mud performed the required functions for the lowest unit cost. A phosphate mud having a water loss of from 4 to 7 cc. and a weight of 11 lb. per gal. is now being used.

Test wells drilled. N. J. Chittim well 37-1 was fractured with a record 270,000 lb. of 20-40-mesh sand and 180,000 gal. of lease crude. It was decided to drill core holes around this well to determine the size and shape of the fracture. The plat shows the location of the 12 core holes. Evidence of the fracture was definitely found in some of the core holes.

Production history. Cumulative production from the original well on the lease which produced from the Eagle Ford shale was 23,705 bbl., when it was abandoned in January 1959. As of May 1, 1960, cumulative production from the San Miguel-1 sand was 258,500 bbl. from 166 producing wells. These wells were potentialed for 20 to 130 bbl., with over 75% above 60 bbl. daily.

Approximately 300 ft. below the San Miguel-1, the San Miguel-5 sand is found productive on the east edge of the field. There are presently two wells dually completed in this and the San Miguel-1 sand producing by means of dual-zone pumps.

The Sacatosa (1,880 ft.) lime was found just north of the San Miguel-5 sand production. Two wells are completed in this sand with dual-zone pumps.

Five miles north of the main San Miguel-1 field, the Navarro C-2 sand was found at a depth of 250 ft. This sand has a large areal extent and is approximately 20 ft. thick with a permeability of 100 to 300 md. Only one well, with a production of 3 bbl. per day, has been completed in this sand. Engineering staffs are now considering how to increase the rate of production from this reservoir.

In the northeast part of the lease, there is one well in the Plumly field. This well was completed in a San Miguel section for the initial open-flow potential of 4,950 M.c.f.d. in April 1956. Cumulative production to March 1, 1960, was 485,856 M.c.f.

Automation, present and future. Large-scale development of this lease provided the company with an opportunity to use extensive automation. It was decided that complete automation of the lease would be the aim. The initial system was designed for only local automation, but a new design will be based upon complete data processing.

Automation of lease producing facilities and handling of collected data can be divided into the following categories:

1. Control and scheduling of oil products.
2. Periodic testing of levels in vessels.
3. Supervision of levels in vessels.
4. Measurement of oil produced and witnessing of its transfer from the lease to the pipeline.
5. Automatic use and storage of production data.
6. Remote operation and transmission of controls and data.

It was decided that to control production a time clock would be located at each pumping unit motor controller. Average wells have a maximum flowing life of from 6 to 9 months. Thereafter, they are put on pump. All wells are connected into automatic test systems which automatically record oil, water, and gas production. The initial recording system was a printout form, but a newer system will present the well information on punched tape for automatic data handling. All vessels have high-level controls which are tied into the necessary alarms and shut-in devices.

The basic unit of the automation system is four 640-acre sections, with four satellite batteries and one central control battery. The satellite battery consists of the header and test equipment. All controls are in the central battery and at this point the total production is separated, stored, and measured.

Comparative Installation Costs, Four Corners Area

Lease	1 Peak Production Bbl. Per Day	2 Tankage Installed With LACT Operation No.-Size	Days' Storage	Cost	3 Estimated Tankage Req'd With Conventional Battery No.-Size	Days' Storage	Cost	3-2 Tankage Savings With LACT	4 Cost Of LACT	3-2-4 Investment Savings (Loss) Of LACT
"A"	10,000	8-500 bbl.	*.4	$40,000	7-5000 bbl.	*3.3	$127,000	$87,000	$11,000	$76,000
"B"	5,000	8-500 bbl.	.8	$40,000	6-3000 bbl.	3.4	$ 78,000	$38,000	$11,000	$27,000
"C"	3,000	4-500 bbl.	.6	$24,000	5-2000 bbl.	3.2	$ 54,000	$30,000	$11,000	$19,000
"D"	2,000	2-1000 bbl.	.8	$15,000	4-2000 bbl.	3.8	$ 42,000	$27,000	$11,000	$16,000
"E"	2,000	8-436 bbl.	1.5	$38,000	4-2000 bbl.	3.8	$ 42,000	$ 4,000	$11,000	($ 7,000)
"F"	700	4-500 bbl.	2.6	$22,000	5-500 bbl.	3.6	$ 28,000	$ 6,000	$ 9,000	($ 3,000)
"G"	500	2-500 bbl.	1.6	$10,000	3-500 bbl.	3.0	$ 15,000	$ 5,000	$10,000	($ 5,000)
"H"	400	2-500 bbl.	2.0	$10,000	3-500 bbl.	3.7	$ 15,000	$ 5,000	$10,000	($ 5,000)
"J"	250	2-500 bbl.	3.2	$10,000	2-500 bbl.	4.0	$ 10,000	0	$10,000	($10,000)
TOTALS	23,850			$209,000			$411,000	$203,000	$94,000	$108,000
AVERAGES	2,650		**.75 (18 hrs.)	$ 23,200		**3.4	$ 45,700	$ 22,500	$10,500	$ 12,000

*Average storage per tank is less with LACT due to higher operating fluid level in two tanks of each battery.
**Ratio of total storage volume of all tanks to total production, column 1.

LACT saves money in Four Corners

• Almost all oil produced by Shell in the Four Corners area is being shipped by lease automatic custody transfer (LACT). Nine positive-displacement metering-type units are in service.

BY W. J. FAIRBANKS
Production Department,
Shell Oil Co., Farmington, N. M.

EXPERIENCE of Shell Oil Co. with LACT in Four Corners indicates that:

• LACT systems require less investment than conventional batteries when installed on large producing leases with minimum storage. In the Four Corners area, a capital savings was released from leases producing over 700 bbl. daily with 0.8 day of storage or less provided. Ideally, leases producing as little as 400 bbl. daily should also have created savings, except that the storage initially provided for the smaller leases proved excessive. Considering all installations, a savings of over $100,000 was realized.

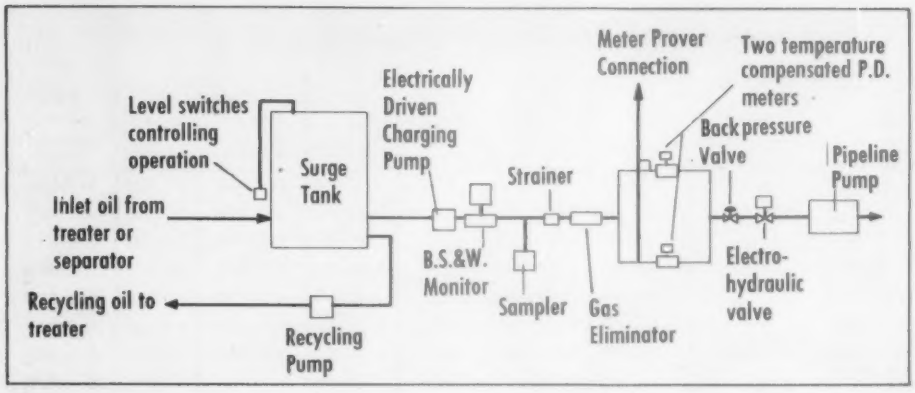
• Operating benefits are probably created for the producer, but quite often cannot be substantiated. This is due to the trouble in placing money values on benefits such as improved oil gravity, reduced tank cleaning, and ultimate future savings. As indicated by experience in this area, labor savings of LACT tend to be small and may be offset by added maintenance.

• Highly reliable and accurate performance can be obtained from a positive-displacement metering-type LACT system. Over 9,000,000 bbl. have been metered from Shell's nine LACT units without serious breakdown and with a cumulative measurement error of less than 0.01%.

The Four Corners area became an important oil-producing region in 1955 after discoveries in the Paradox basin and Aneth field of Utah and the San Juan basin of New Mexico. Drilling and production were limited, however, due to the lack of a suitable means of moving crude to major markets.

MAP SHOWS REMOTENESS of Shell leases in Four Corners. Fig. 1.

Presented at Pacific Coast District, API Division of Production, Los Angeles, under original title, "Case History—Results of Lease Automatic Custody Transfer."



LACT OPERATION is shown for Four Corners. Fig. 2.

In January 1957 Four Corners Pipe Line Co. was formed and soon afterward started construction of a pipeline to California. Full-scale shipment through this line began in March 1958. A few months later, a pipeline to Texas was completed by Texas-New Mexico Pipe Line Co.

The time required to obtain a pipeline outlet for Four Corners crude provided an excellent chance for evaluating and planning LACT. As drilling was continued during this waiting period, good estimates of peak production and reserves were available prior to connection to a pipeline, making possible a realistic evaluation of LACT versus manual gaging. Also, adequate time was afforded for design, obtaining approvals, and installing LACT before full-scale oil-handling facilities were needed.

Another important factor boosting LACT in Four Corners is the remoteness of producing leases and the lack of improved roads. As shown in Fig. 1, Shell's producing leases are located in isolated sections of Utah and New Mexico, mostly on the Navajo Indian Reservation or on government lands. The land in general is arid, badly eroded, and made up of rocky mesas, arroyos, and dry washes. So considerable time is required to travel between leases, making it advantageous to use automation as a means of reducing trips.

LACT Design

A positive-displacement metering-type LACT system was chosen as the standard for Shell's installations in Four Corners. Equipment was selected to do the usual necessary jobs of a LACT system:

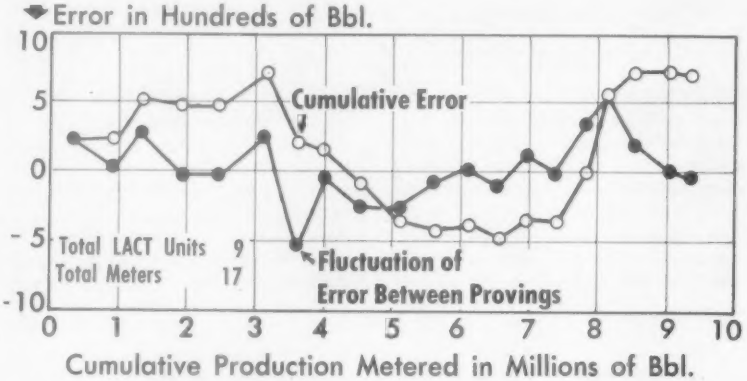
1. Automatically transfer crude from producer to pipeline.
2. Accurately measure the volume of oil shipped.
3. Obtain a representative sample of crude shipped for oil gravity and b.s. and w. content determination.
4. Prevent shipment of oil above a maximum allowed per cent b.s. and w.
5. Stop shipment when malfunctions occur which might create measurement errors, oil losses, or equipment damage.

The Four Corners LACT system operates in this manner (Fig. 2):

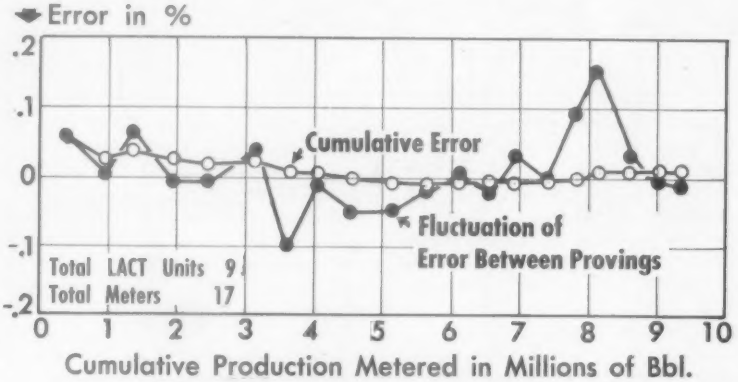
When the oil level in the surge tank reaches a predetermined level, a float switch opens an electrohydraulic valve and starts a charging pump and a pipeline pump. Oil is forced by the charging pump through a strainer, gas eliminator, and two temperature-compensated p.d. meters in parallel at a pressure greater than 10 psig. to eliminate gas breakout.

After measurement by the meters, oil is moved through a back-pressure regulator into the suction line of the pipeline pump. When the level in the surge tank is depressed to a predetermined low level, crude shipment is stopped by the closing of the electrohydraulic valve and the stopping of the charging and pipeline pumps.

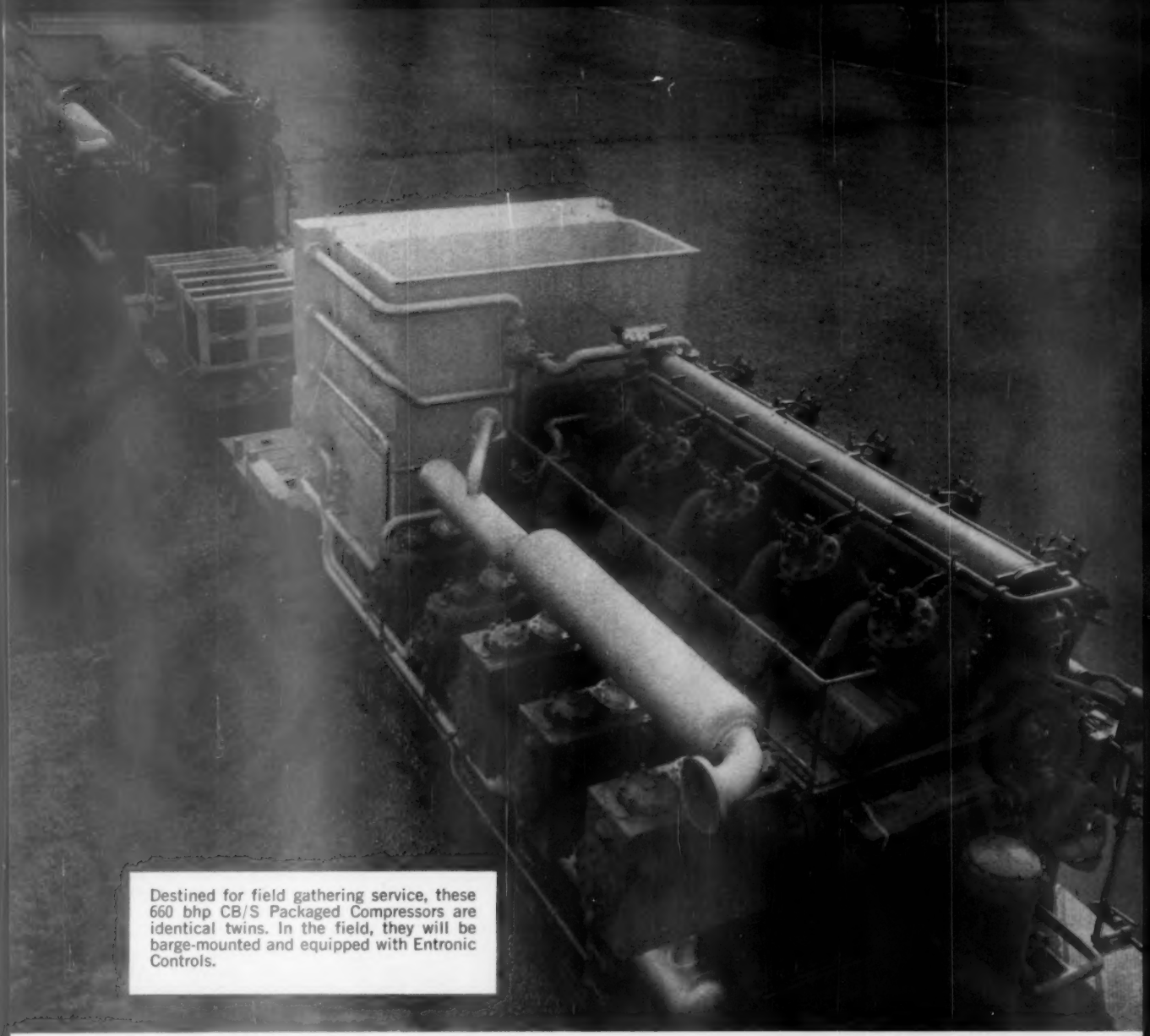
The oil stream is sampled into a pressurized container before being metered. A representative sample is obtained by using an impulse contactor on each meter to open and close a solenoid-operated three-way valve once per barrel. A b.s. and w. monitor



CUMULATIVE ERROR for 2-year period was only 700 bbl. Fig. 3.



OVERMEASUREMENT amounted to only 0.0007%. Fig. 4.



Destined for field gathering service, these 660 bhp CB/S Packaged Compressors are identical twins. In the field, they will be barge-mounted and equipped with Entronic Controls.

Building packaged compressors is our business . . . our only business. This single objective is the reason CB/S Packaged Compressors are more advanced in design . . . more efficient in the field.

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CB/S

C-B SOUTHERN, INC., P. O. BOX 19267, HOUSTON 24, TEXAS

A subsidiary of The Cooper-Bessemer Corporation.

As delegate to a political convention, Joe Roughneck says he found out there's more to "rigging" than he'd thought. But on home ground, Old Pro Joe knows what to expect, when he's choosing supplies for oil well drilling. Joe demands Lone Star pipe because he knows he can depend upon its tough reliability. Made to API specifications, Lone Star casing, tubing and line pipe undergoes exacting quality control and multiple testing. It's conveniently available too. Made in the heart of the oil country, Lone Star pipe is deliverable overnight to 75% of Mid-Continent producers.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

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Houston, Texas | Midland, Texas | Tulsa, Oklahoma

probe is installed in the discharge of the charging pump to stop shipment if the b.s. and w. of the crude should exceed 1%. Oil shipment is halted by high cut, failure of the meters to count, and excessive gas or air in the deaerator.

The nine LACT units in operation in the Four Corners area are similar in design, differing only in the size of p.d. meters, charging pumps, and connected piping. Also, one of the units is a single rather than a double-meter installation. The maximum throughput capacity of individual units varies from 4,000 to 11,000 bbl. daily, with an average capacity per unit of 7,000 bbl. daily.

LACT Profitability

Installed costs of nine LACT units versus conventional batteries are compared in Table 1. A total savings of $100,000, or $12,000 per unit, was realized from all units as a whole. This savings resulted from an average of 18 hours' storage with LACT as compared to an estimated 3 to 4 days' storage with manual gaging.

A net investment savings was realized on those leases where peak production of over 700 bbl. per day was obtained and where no more than 0.8 day's storage was installed. On five leases, where more than this amount of storage was provided, including the relatively large producer, Lease "E," the capital cost of LACT was greater than that of conventional batteries.

Several circumstances led to excessive tankage being placed on these leases, the most important being the overoptimistic prediction of future production, and the need of extra tankage for trucking and manual-gaging operations that preceded LACT. Had it proved possible to restrict tankage to 0.8 day on all leases, a capital savings would probably have been realized on leases producing as little as 400 bbl. per day rather than 700 bbl. per day as actually experienced.

The capital advantage of LACT compared to manual gaging is relatively easy to determine. But an evaluation of operating economies is not so straightforward. Some of the benefits probably realized, such as oil-gravity improvement and salvaging tank bottoms, are hard to prove and evaluate in dollars. Reduction of tank-cleaning expense may likewise be obtained; but it is hard to evaluate because unrelated factors such as treating and recirculation also affect the deposition of paraffin in tanks.

Also, considerable producing experience under manual operation is needed to provide data to compare with LACT operation. Placement of money values on benefits like greater measurement accuracy and increased

safety to personnel is even more difficult. Obvious advantages of LACT, like greater flexibility for future field development and minimizing possible future tankage - replacement costs, could actually prove of more value than all other benefits, but depend upon the future.

On Shell's installations, labor savings was the only benefit where money value could be stabilized. Actual savings to the producer proved to be quite small, about $400 per year per installation, and, to date, have been more than offset by LACT repair and maintenance costs of nearly $600 per unit per year. About half of this expense, however, is the cost of routine maintenance which might possibly be reduced by relaxing maintenance practices.

As a minimum of manual gaging was done before LACT, comparative data on benefits such as gravity improvement and reduced tank-cleaning expense were not obtained. We suspect, nevertheless, that considerable savings are being realized through reduced tank-cleaning expense. Tank-cleaning expense on the LACT installations has been practically zero, even though, in general, paraffin deposition has become troublesome elsewhere in the crude-handling systems.

Four Corners Pipe Line Co. reports that labor savings amounting to about $24,000 per year, or $1,140 per unit per year, are being realized from 21 LACT units concentrated in southeastern Utah. Partially offsetting this saving has been a meter-proving expense estimated at $8,600 per year or $410 per unit per year.

Operating and Maintenance

Since LACT was installed in 1957 and early 1958, reliable automatic operation has been obtained. Failures have occurred but have not been serious enough to hamper continuity of transfer. The cost of maintaining the LACT units, which had operated at an average of 19 months at the end of 1959, has been about $600 per unit per year. Roughly, the breakdown of expense has been:

50%—routine maintenance.
15%—repair of electrical controls and components.
10%—meter repair.
6%—repair of charging pumps.
6%—monitor repair and calibration.
12%—miscellaneous items.

Routine maintenance, amounting to 50% of total LACT repair and maintenance cost, or $300 per unit per year, has consisted of monthly checking the operation of the b.s. and w. monitor, switches, valves, and con-

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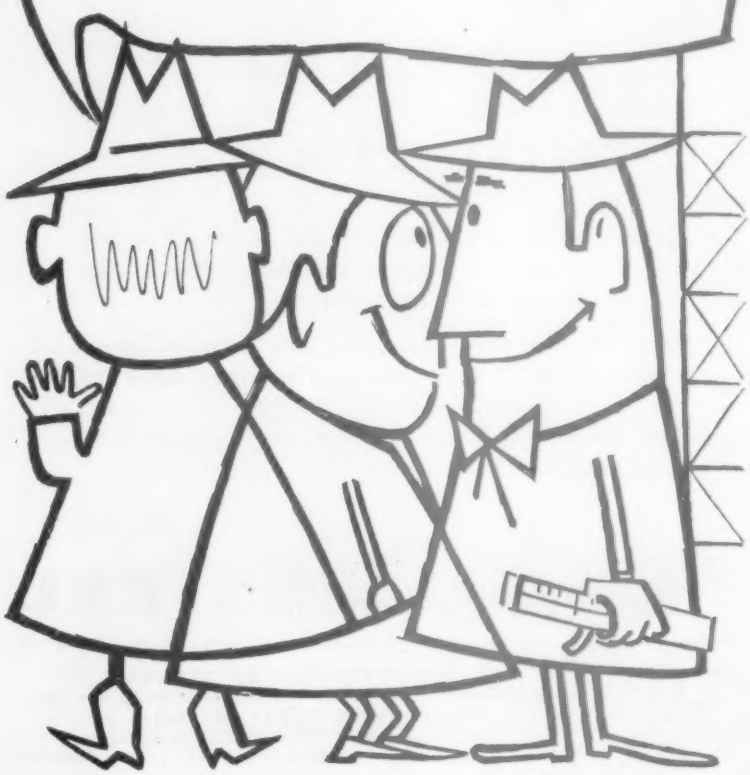

tacts, and twice-yearly inspecting and cleaning the monitor probe, deaerator gas valve, sampler components, and pressure gages. The remaining cost of LACT maintenance, an added $300 per unit per year, has been the expense of unscheduled equipment repairs.

Repair and maintenance labor for eight of the LACT units is furnished or contracted by Four Corners Pipe Line with the producer bearing the full cost of such labor. Meter proving for these units is performed and paid for by the pipeline company. On the one lease served by Texas-New Mexico Pipe Line Co., the producer has assumed the full responsibility and cost for maintenance and meter proving.

Meter Accuracy

From October 1957 through December 1959, more than 9,000,000 bbl. of crude was delivered to the pipeline through 17 p.d. meters. As of the end of December, the cumulative error of the meters was an overmeasurement of about 700 bbl. or +0.007% (see Figs. 3 and 4). Between successive proving tests the error of the meters as a group ranged from +552 bbl. (+0.145%) to −552 bbl. (−0.101%); but due to averaging out of over and undermeasurements, the cumulative error is negligible.

The change of meter factor during the intervals between proving runs was less than ±0.0030 (0.3%) in about 80% of the proving runs; it was from ±0.0030 to ±0.0099 (0.3 to 0.99%) in 19% of the runs, and exceeded ±0.0100 (1%) in only four instances Several of the meters have needed occasional minor repairs but only one meter has required a major overhaul. The oil run through individual meters between provings has ranged from 37,000 to 185,000 bbl.

P.d. meters measuring crude to Four Corners Pipe Line in Utah are proved monthly to comply with state requirements. Meters on the LACT unit delivering to Texas-New Mexico Pipe Line Co. are proved about once every 6 months. In proving meters, both pipeline companies require that calibration runs be repeated until the meter factor on two successive runs is within 0.0005 to 0.05%.

Acknowledgment

The author expresses appreciation to Four Corners Pipe Line Co. for cooperation in supplying operating and maintenance cost information pertinent to this paper.

"Engineered Fracture Treatments Make Noncommercial Field Pay Off."
—See page 93

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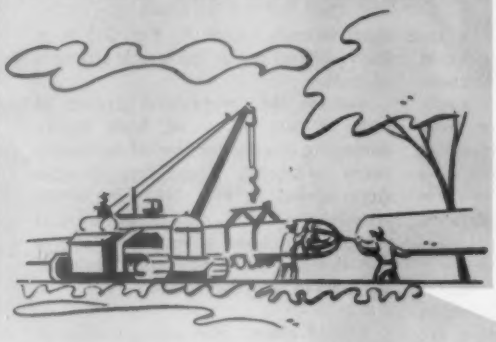

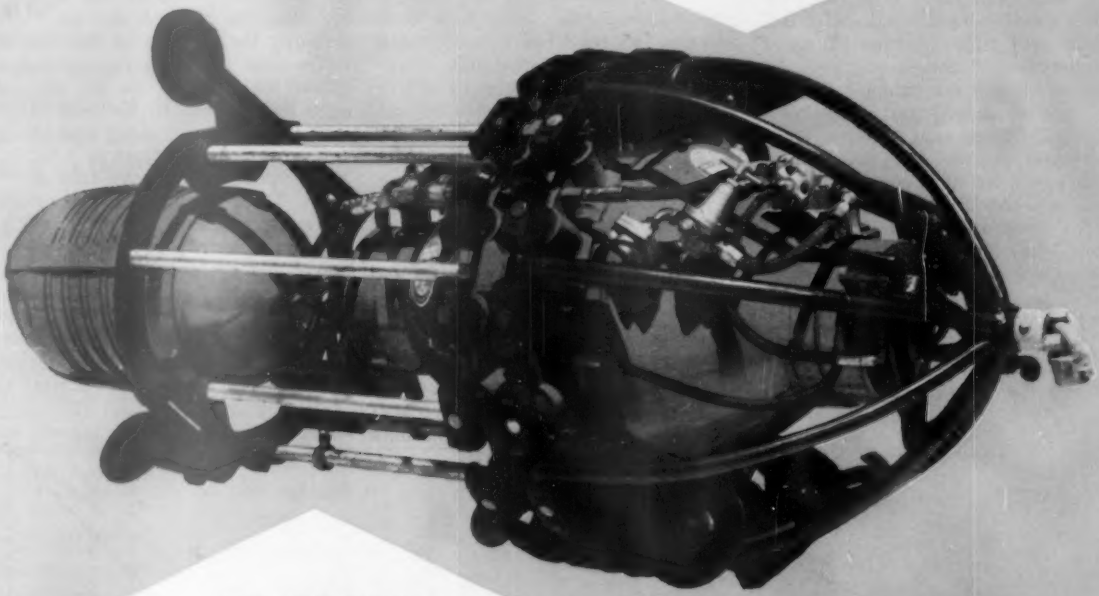

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Why sucker rods fail (continued)

BY JOSEPH ZABA

AS STATED in the general considerations of stresses and fatigue in the preceding installments, fatigue and endurance limit, assuming noncorrosive conditions, are affected by maximum stress, range of stresses, and number of reversals. Applied to sucker rods this statement may be interpreted as meaning that for a given set of noncorrosive conditions, the frequency of failures of rods depends on peak polished-rod load, range of loadings, and speed of operation. The latter governs the number of changes of stresses from minimum to maximum tension.

The effect of peak polished-rod load is obvious. The range of loadings requires special consideration and is discussed here. The question of speed of operation, if considered from the point of view of the pumping installation as a whole, requires certain compromises. From the standpoint of sucker-rod stresses alone, the consideration of speed of operation must include not only the question of number of stress applications and of dynamic loads involved but also the effect on stresses of the natural vibration of rods.

Range of Loadings

The Goodman diagram, Fig. 20, illustrates the principle that the minimum stress must increase with increase in maximum stress in order to maintain the allowed range of stresses. In effect this means that the conditions of steady loading must be more closely approached as the maximum stress increases. The diagram shows only the pattern of the allowable stresses, emphasizing the importance of the range of stresses.

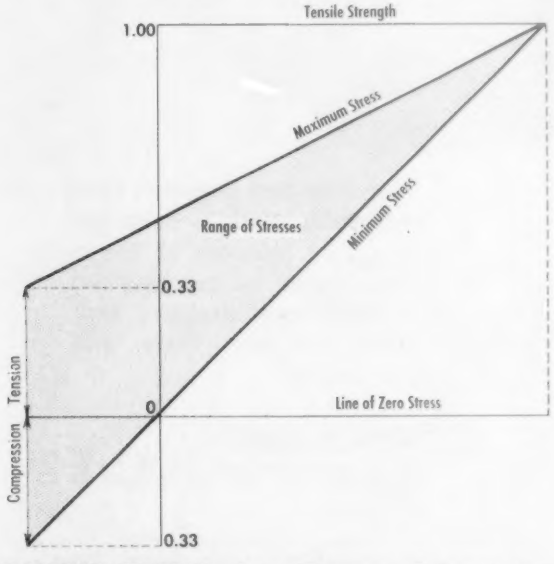
It is of interest to note that in deep-well pumping, with weight of sucker rods representing a very large part of the polished-rod load, conditions are favorable for maintaining a narrow range between the upstroke and the downstroke loadings. In the medium and shallow-depth pumping of large volumes of fluid, particularly with high speeds of operation, the downstroke load may be low compared to the upstroke load and caution must be exercised in selecting of the allowable maximum stress to maintain the proper range of stresses.

For this type of condition A. A. Hardy suggested a modified Goodman diagram.[1] Because of severe conditions under which sucker rods perform, the diagram is based on certain special arbitrary assumptions. Fig. 21 shows such a diagram constructed for a hypothetical steel. The point of conversion of lines of maximum and minimum stresses (point A, Fig. 21) is at the yield and not at the tensile strength of steel.

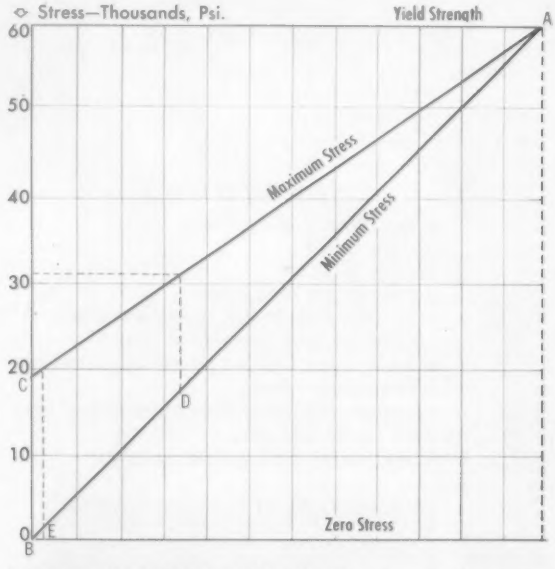
Because the compressive stresses in rods, if they do occur, have highly damaging effects, the line of minimum stress is started at the line of zero stress (point B, Fig. 21). The corresponding point of maximum stress is placed arbitrarily at half the laboratory-determined air-fatigue limit of the steel in question (point C, Fig. 21).

Use of chart. The configuration of the chart for any given steel may be different from that shown depending on the assumptions of the designer regarding the allowed stresses. Once prepared for the steel of the rods to be used, the chart furnishes convenient means for checking on the allowed range of stresses. Its use may be illustrated by the following example:

Assume pumping depth of 3,500 ft., 2¼-in. pump, and twenty-four 64-in. s.p.m. Three-fourths inch rods made of steel represented by chart in Fig. 21 were selected. While such selection would not ordinarily be made it is here used to underscore the point in question. Using Mills' formula and the formula for minimum polished-rod load (Installment 7), the maximum and minimum loads are calculated to



GOODMAN DIAGRAM. From "Summary of Present Day Knowledge of Fatigue Phenomena in Metals," Proc. ASTM Part 1, v. 30, p. 260, 1930. Fig. 20.



MODIFIED GOODMAN DIAGRAM. This chart is for a particular steel operating under assumed conditions. Each set of conditions and each different type of sucker rod requires one of these charts. Fig. 21.

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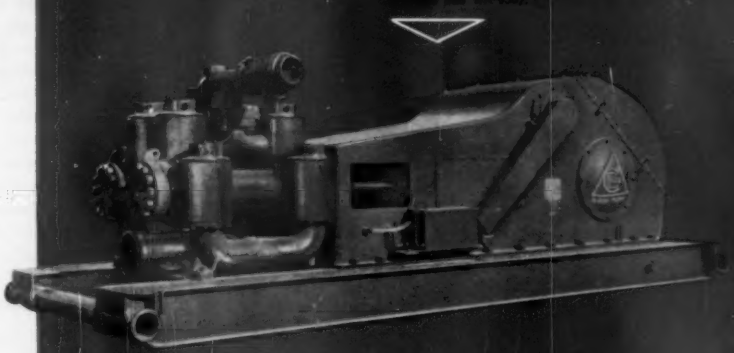

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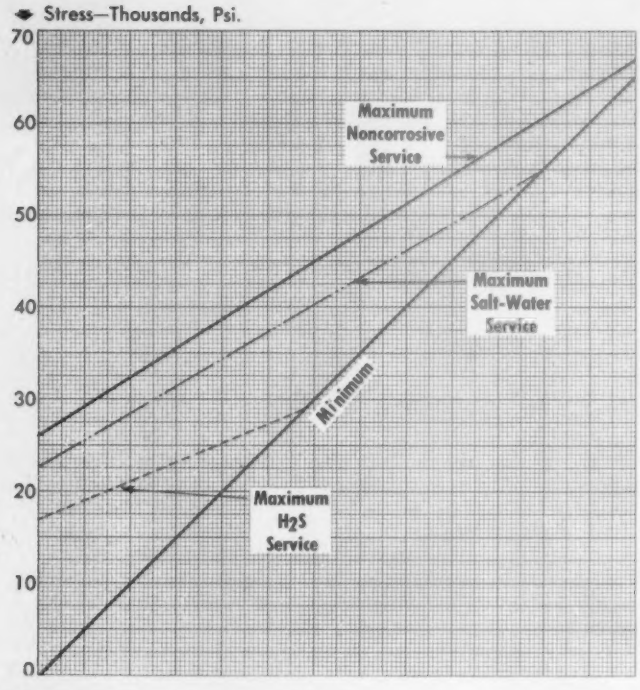

MODIFIED GOODMAN DIAGRAM for corrosive fluid environment. Fig. 22.

be 14,100 and 2,000 lb. respectively. The maximum stress is then:

$$14{,}100/0.4419 = 31{,}900 \text{ psi.}$$

The corresponding minimum allowed stress is around 18,000 psi. (point D, Fig. 21). The calculated minimum stress

$$2{,}000/0.4419 = 4{,}525 \text{ psi.}$$

(point E, Fig. 21), is outside of the allowed range of stresses.

Disregarding all other considerations and again for the purpose of a simple illustration of the chart let's assume that ⅞-in. rods will be used. The maximum load will now be 17,100 lb. and the minimum load 2,800 lb. Then the maximum stress is

$$17{,}100/0.601 = 20{,}000 \text{ psi.}$$

From Fig. 21, point E, the corresponding minimum stress is around 1,800 psi. The calculated minimum stress is

$$2{,}800/0.601 = 4{,}600 \text{ psi.}$$

which is within the allowed range of stresses.

The chart as presented is for noncorrosive service or for service in which corrosion is inhibited with 100% efficiency. For corrosive service the maximum stresses are usually lowered by certain selected factors. Chart in Fig. 22 is for a commercially available 4600 series steel rod with factors of 0.90 and 0.64 used respectively for salt-water and hydrogen sulfide service.[2]

As indicated in the chart, consideration of corrosion narrowed down considerably the range of stresses. The range of stresses is only one of the factors which must be considered in the design of rod strings. The purpose of the design is to select the rods which will furnish the desired production with a minimum of cost and weight of the string and a maximum expectancy of a failure-free operation. As could be expected there are sharp differences of opinions regarding the relative importance which should be assigned to these different factors.

References

1. A. A. Hardy, "Polished-Rod Loads and Their Range of Stress": Paper presented at the fifth annual West Texas Oil Lifting Short Course, Lubbock.
2. Personal communication, A. A. Hardy.

BOOKS

Note: The Oil and Gas Journal maintains a book department. Write to the READER SERVICE DEPARTMENT, P. O. Box 1260, Tulsa 1, for copies of the book list. Often books reviewed here may be purchased from this source.

TECHNICAL COMMUNICATION. By George C. Harwell. Published by Macmillan Co., 60 Fifth Avenue, New York City 11. 332 pp. $5.

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Chapter 10 tells how to present tables, graphs, and figures so that they can easily be understood. The appendix contains a concise manual of the rules of composition and a glossary of usage.

ELEMENTARY THEORETICAL FLUID MECHANICS. By Karl Brenkert, Jr. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York City. $7.50. 348 pp.

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THERMAL ENGINEERING. By Harry L. Solberg, Orville C. Cromer, and Albert R. Spalding. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York City 16. 649 pp. $9.50.

This volume is a revision and extension of "Elementary Heat Power" by the same authors.

The first law of thermodynamics and its applications in the form of the energy balance is the unifying theme of the book. The material balance is applied to the combustion process and to the flow of fluids in machinery.

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Major types of prime movers, heat exchangers, compressors, etc., are described in sufficient detail to convey an understanding of how they are constructed, how they operate, what their performance is, and what principal factors limit this performance.

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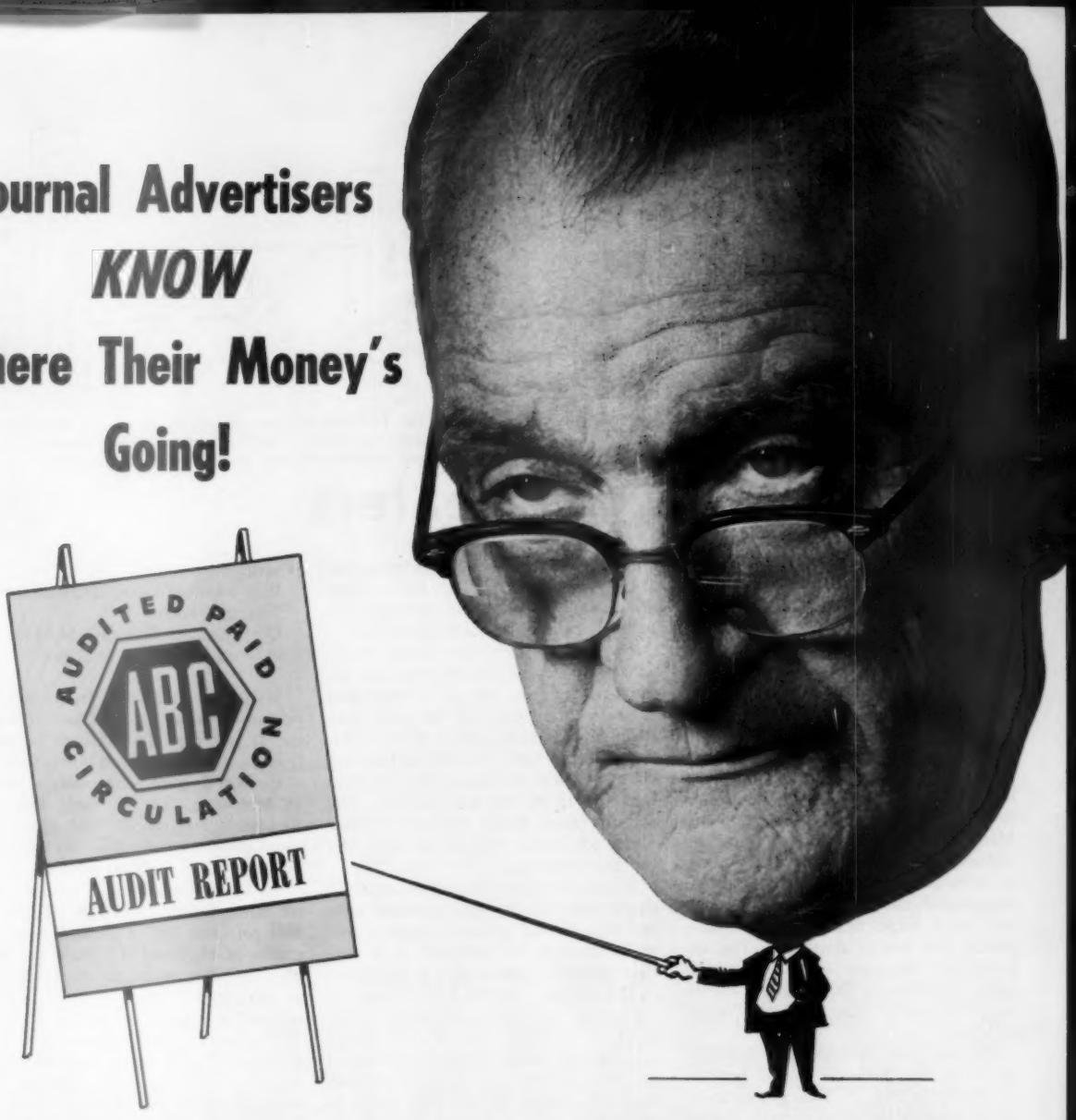

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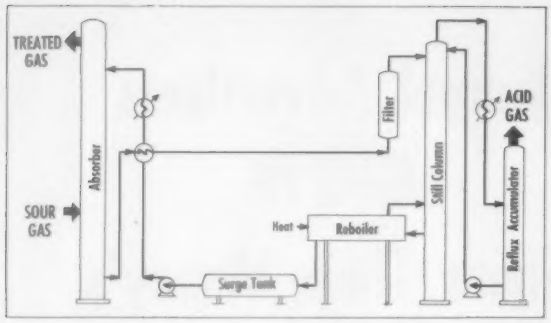


COST OF EQUIPMENT for an aqueous amine gas-treating plant depends largely on the gas volume, operating pressure, and amount of acid gases in the gas stream. Fig. 1.

TREATMENT OF SOUR GAS with an aqueous solution of monoethanolamine (MEA) for the removal of hydrogen sulfide (H_2S) and carbon dioxide (CO_2) is the best-known and most widely used sweetening process in the natural-gas industry.

It is often desirable to approximate the size and cost of equipment when making an economic study of a proposed gas-treating plant. The following material is intended as a guide in sizing the necessary equipment. Methods presented here are based on conservative design with the emphasis on trouble-free operation. The actual design and costs involved are dependent to a large extent on company policy and design standards. The experienced engineer will be able to make allowances for unusual conditions that may exist at any specific location.

Process flow. A schematic flow diagram of the aqueous amine process is shown in Fig. 1. The gas containing hydrogen sulfide or carbon dioxide or a combination of these acid gases enters the absorber near the bottom and flows upward through the tower. As it flows upward, it is brought into intimate contact with the aqueous amine solution. The gas gives up its acid-gas content to the amine. The treated gas, essentially free of acid gas, leaves the top of the absorber tower.

Regenerated amine is picked up from the amine storage tank and pumped through a heat exchanger and solution cooler into the absorber tower near the top. The amine solution then flows down through the tower. As the solution flows down through the tower, the amine reacts with the acid-gas constituents and removes them from the gas stream. The amine solution carrying the acid gases in chemical combination flows from the absorber tower through a heat exchanger where it is heated by hot solution leaving the regeneration unit. The solution then flows through a filter where any solids picked up from the gas are removed.

From the filter, the amine solution flows into the stripper column near the top. As the solution flows downward through the stripper, it is further heated by steam that is generated in the reboiler. As the temperature of the amine solution is increased, reactions are reversed, and the acid gases are released from solution and carried out the top of the stripper column with the excess steam. The steam is condensed and separated from these gases in the reflux accumulator. The acid gases are removed from the system and the steam condensate is returned to the stripper column as reflux. The regenerated amine solution flows from the stripper column to the reboiler and on to the amine solution surge tank, thus completing the circuit.

Amine-solution circulation rate. Based on circulating a 20%-by-weight solution of MEA in water at a rate sufficient to pick up 0.3 mole of acid gas per mole of amine, the required amine-solution circulation rate can be calculated as follows:

$$R = 13{,}280\ Qm$$

Where:

R = amine solution circulation rate, gal./hour
Q = inlet gas flow rate, M.M.s.c.f.d.
m = mole fraction acid gas

Hydrogen sulfide is frequently reported as grains of H_2S per 100 std. cu. ft. of gas. To convert to mole fraction, multiply by 0.00001588.

Carbon dioxide is normally reported as mole per cent or mole fraction. The mole fraction of acid gas is the sum of the mole fraction of H_2S and the mole fraction of CO_2.

As an example, let us assume that we have 20 M.M.s.c.f.d. of gas at 500 psi. and 80° F. containing 150 grains of H_2S and 0.5 mole per cent of CO_2. We want to treat the gas so that it will meet pipeline specifications of 1 grain or less of H_2S per 100 std. cu. ft. One hundred and fifty grains of H_2S is equal to $0.00001588 \times 150 = 0.0024$ mole fraction. The mole fraction of acid gas will be $0.0024 + 0.0050 = 0.0074$ mole fraction of acid gas.

The amine-solution circulation rate will be:

$$R = 13{,}280 \times 20 \times 0.0074$$

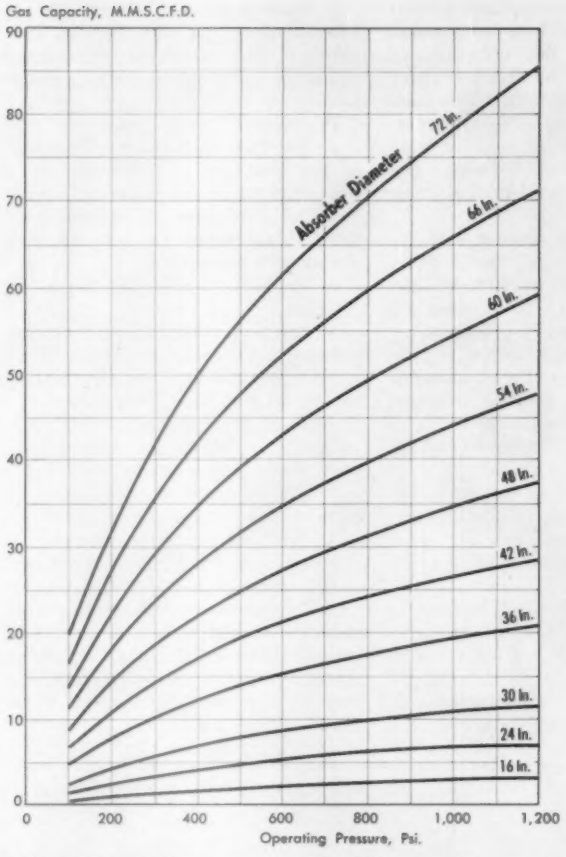
$$= 1{,}965 \text{ gal./hour}$$

Absorber size. The diameter of the absorber can be calculated from the gas volume, operating pressure, operating temperature, and amine-solution circulation rate using standard design procedures for the type of contact section being utilized. Fewer than five theoretical contact stages are normally required; however, it is standard practice to use 15 to 20 bubble-cap trays. Packed columns are normally used for small-diameter contactors.

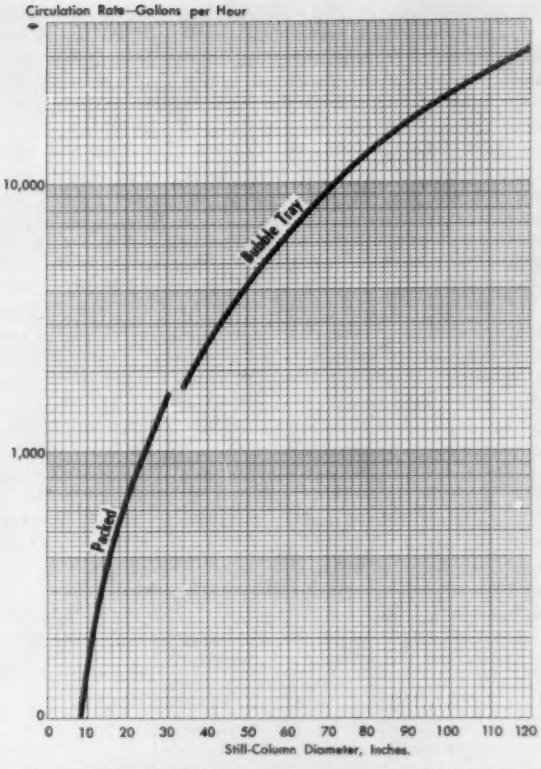
Fig. 2 can be used to determine the required absorber diameter for units with normal amine-solution circulation rates. For high-solution circula-

Extracted from "The Removal of Hydrogen Sulfide from Natural Gas," by Glenn C. Opel, presented at the 1960 gas-conditioning conference, Norman, Okla.

"Methods presented here are based on conservative design with the emphasis on trouble-free operation. The actual design and costs involved are dependent to a large extent on company policy and design standards."



CONTACTOR DIAMETER can be estimated using these curves. Fig. 2.



STILL COLUMN DIAMETER is a function of amine solution circulation rate. Fig. 3.

tion rates, allowance must be made for downcomer area.

Continuing the example, we see from Fig. 2 that a 42-in.-diameter absorber will handle approximately 19 M.M.s.c.f.d. at 500 psi. In all probability the absorber will operate below 500 psi. at times and therefore it is highly advisable to go to a 48-in.-diameter absorber to handle 20 M.M.s.c.f.d.

Reboiler heat load. Using adequate heat exchange to preheat the amine solution to 170° F. before entering the still column, a heat input to the solution of approximately 1,650 B.t.u. per gallon of solution circulated will be required in the reboiler. This allows for generating approximately 1 lb. of excess steam per gallon of solution circulated and should give adequate solution regeneration at still column pressures to 10 psig.

Again continuing our example, the 1,965 gal. per hour circulation rate would require a heat input to the amine solution of:

$$1{,}965 \text{ gal./hr.} \times 1{,}650 \text{ B.t.u. gal.}$$

$$= 3{,}250{,}000 \text{ B.t.u./hr.}$$

Still-column size. The diameter of the still column is a function of the amine-solution circulation rate as shown in Fig. 3. It is based on operating the still column at 6 psig. Again 15 to 20 bubble-cap-type trays are normally used. Packed columns are normally used for small-diameter still columns.

Operating Costs

Next to be considered are the factors that affect operating costs. Of course there are the inevitable costs such as interest on the investment, taxes, insurance, depreciation, etc. These are left for the accountants to evaluate. What is touched on lightly in this discussion are the things that the design engineer must take into consideration in the design of a plant. Some of the operating costs are: (1) fuel, (2) power, (3) reagents, (4) operating labor, (5) maintenance, and (6) lost production due to down time.

The cost of fuel is related to the amine-solution circulation rate. Normal design of the regeneration system calls for approximately 1 lb. of excess steam per gallon of solution circulated. This is steam in excess of the amount required to raise the temperature of the solution from the temperature at which it enters the still column to the operating temperature of the reboiler. There are a number of ways of reducing the amount of heat required. However, before attempting to reduce the fuel requirements, the consequences should be fully considered. Some of the ways that fuel consumption can be reduced are:

1. Reduce the amine-solution circulation rate. All other factors remaining constant, a reduction in solution circulation rate will cause an increase in the acid-gas pickup per mole of amine circulated. If this is done, watch for increased corrosion in the equipment coming into contact with the rich-amine solution. A reduction in the amine-solution circulation rate may raise the temperature in the contactor due to the heat of reaction to the point where the gas cannot be fully treated.

2. Increase heat exchange between the hot regenerated solution and the rich amine. This will reduce the amount of sensible heat required to raise the temperature of the solution

to the operating temperature of the reboiler. If this is done, watch for excessive corrosion in the heat exchanger and piping handling the heated solution.

3. Reduce the amount of excess steam used in regenerating the solution. A reduction in excess steam will cause an increase in the residual acid gas remaining in the regenerated solution. This, in turn, will cause an increase in the acid-gas content of the treated gas. It will also act to increase the acid-gas loading of the rich-amine solution causing increased corrosion in equipment handling the rich solution.

The cost of power, as used in this discussion, is the cost of pumping the amine solution. Therefore, the cost of power will increase as the operating pressure of the absorber is increased, and also as the amine circulation rate is increased. The use of amine-solution pumps that use the high-pressure rich-amine solution to furnish most of the energy required shows promise of reducing pumping costs in gas treating. This type of pump is widely used in the glycol-dehydration field.

Cost of amine for the initial charge depends on the volume of solution required to fill the system to operating levels. This is not nearly as important a factor as the cost required to maintain the solution at operating levels. Amine can be lost from the system in a number of ways.

1. Loss of amine as equilibrium vapors with the treated gas. This loss is small and varies with the operating temperature and pressure of the absorber. It can be reduced to essentially zero by the use of a water-wash section following the amine-gas contact section.

2. Loss of amine as mist from the amine-gas contact section. This loss can be reduced by the use of efficient mist extractors in the contact tower. The water-wash section mentioned above is also effective in eliminating amine loss due to mechanical entrainment.

3. Loss of amine due to mechanical leakage. This loss can be held to a minimum by proper maintenance of pump packing, valves, etc.

4. Loss of amine due to amine-solution contamination. Solution contamination often causes foaming of the amine solution. A large quantity of amine can be lost in a short time when the unit is upset by the foaming condition, in either the amine-gas contactor or the still column. On small units it is often necessary to discard the contaminated solution as reclamation equipment is not always available.

The cost of operating labor will vary from one unit to the other. In many cases in which the amine unit is operated on a single well, or on a small gathering system, the operator, or pumper as he may be called in some fields, can take care of the operation of the amine unit as well as his normal duties. On larger units it may be necessary or advisable to have one or more operators just for the amine unit.

The cost of maintenance and the cost of lost production due to down time are difficult to predict. Maintenance problems and down time are the result of operating problems.

Operating problems commonly encountered in the operation of an amine unit are corrosion, solution foaming, and solution contamination.

The following recommendations are made to minimize corrosion:

1. Limit of acid-gas pickup in the absorber to 0.3 mole of acid gas per mole of amine circulated.

2. Limit amine concentration to 15 or 20 wt. %.

3. If steam or hot oil is used to heat the reboiler, limit the temperature of the reboiler heating medium to 300° F.

4. Stress relieve all components of the system after fabrication.

5. Prevent contact between the solution and oxygen from the air. Provide a blanket of treated gas over the amine solution in the amine surge tank.

Foaming is caused by:

1. Presence of liquid hydrocarbons in the inlet gas or condensation of hydrocarbons in the absorber.

2. Solution becoming contaminated with certain chemicals that are used during well completion.

3. Presence of solid particles in the solution.

4. Solution contamination by impurities in the makeup water.

This problem can be minimized by taking the following precautions:

1. Provide an adequate inlet separator to effectively remove liquids from the inlet gas stream.

2. Continuously filter the solution to keep it free from solid particles.

3. Add only steam condensate or demineralized water as makeup water.

In conclusion, it is pointed out that a conservative initial design can greatly reduce operating costs through decreased operating problems. When operating problems are decreased, the cost of operation of the unit is reduced.

LEASE TIP

Simple pressure switches hold level in disposal tank

WHERE several wells feed the same disposal well and a tank is used to hold the brine, a simple pressure switch will hold the level in the tank so that no air is pulled into the hole and so the oil seal will remain on the water surface.

The tank is hooked up in the usual manner and a pressure switch is placed near the bottom which turns on the pump when the tank is about three-fourths full and turns off when the tank is about one-half full. Another switch placed about 3 ft. above this one serves as a safety switch. If the well for any reason fails to take the water, the safety switch dumps the water into a storage pit and maintains the level about a foot higher than the lower switch until the trouble is corrected.

The new, Appleton "CES-CESD" type receptacle Unilet and matching plug is feature-packed to give you outstanding performance for all industrial equipment requiring heavy-duty circuit breaking outlets *without* disconnect switches ahead of the outlet.

You will particularly like the installation simplicity—the push-pull operating ease and these Appleton convenience features . . .

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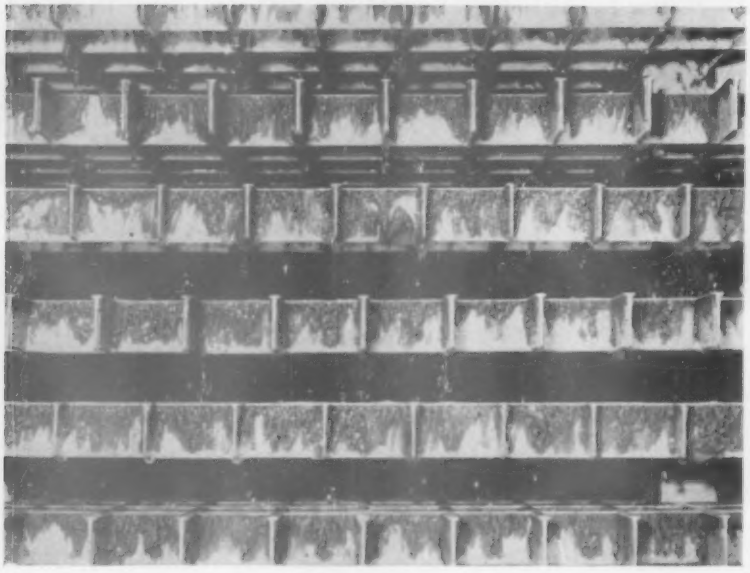

Plastic packing has proved its worth in cooling towers. Now comes a . . .

New plastic packing for trickling filters

A NEW plastic packing has been developed by Fluor Corp., Ltd., to replace the rock bed now commonly used in trickling filters.

Marketed under the trade name Poly-Grid, the new packing is of lighter, more open construction and it operates at a much higher efficiency than the rock fill. Features include extended surface, splash grids for air and water redistribution, and a high strength-to-weight ratio.

Pilot-plant studies with this type of packing show:

- Consistent removal of 99% of the phenol in waste waters at loadings up to 32 lb. phenol per M.c.f.d.
- Effluent contains less than 0.5 p.p.m. sulfides. And the effect of sulfides on phenol removal is negligible up to sulfide concentrations of 50 p.p.m.
- Packing remains completely free from plugging or bridging by biological slime.
- After 3 years of service (2 of them in a cooling tower and 1 in the trickling filter) there were no signs of attack by biological growth or by chemicals in the water.

This plastic packing is formed by injection molding from either high-impact polystyrene or linear polyethylene, depending upon the properties required. Originally developed for use in cooling towers, it found such wide application there that an experimental program was undertaken to determine its possibilities for trickling filters. Both applications are essentially the same; namely, to provide maximum air-water contact at minimum cost.

A pilot-scale packed tower was built (see box) to obtain data on the bio-oxidation of various industrial wastes. Phenolic wastes were among those studied extensively, and the data presented here were obtained with this type of waste water.

Phenol removal. An hydraulic loading of 3 g.p.m. per sq. ft. was used for all runs. Phenol concentrations in the entering waste stream ranged from

Details of the pilot plant

THE PILOT PLANT consists of two 3 by 3 by 15-ft. wooden towers. Each tower is mounted above a 33 by 96 by 30-in. steel basin. Towers are packed with high-impact polystyrene Poly-Grid modules. Suitable piping and valves are connected to the two units which enables them to be operated either independently or in series.

Each unit is supplied with a centrifugal pump to circulate process water, and a recording flowmeter to measure liquid flow. Feed is supplied from storage to each tower by a chemical-feeder pump connected to the line supplying the recirculation pump. Effluent discharge is controlled by an outlet weir, and the water is discharged to the sewer.

Temperature is controlled by a sensing element in the basin which directly controls a valve in the steam line supplying submerged coils in the basin. Traps equipped with a thermostat control the return of condensate to the boiler. A small fan at top of tower induces flow of air through packing.

Operation is essentially automatic once the controls have been properly adjusted and equilibrium attained.

In operation, water is drawn from the basin by the recirculating pump at a point directly beneath the tower, and the feed solution is injected into this stream just before it enters the pump. A metered stream of tap water also enters the system at this point, thereby allowing the concentration of phenol in the feed to be controlled. This scheme takes advantage of the mixing action provided by the pump before the water is distributed over the top of the packing. Following distribution, water flows down through the packing and into the basin. Aeration is accomplished by contact with a countercurrent stream of air induced by the exhaust blower.

Phenol was determined by ultraviolet absorption.

CLEAN FUEL

WARNER LEWIS EQUIPMENT PROTECTS THE JETS

Clean jet fuel is essential to safe jet aircraft operation. Today, all aviation fuels may be provided the ultimate protection against fuel contamination. The new Warner Lewis 2-stage separator/filter eliminates jet fuel contaminants — free water and dirt — and delivers the cleanest fuel ever demanded by commercial or military aircraft.

A Silent Servant of Safety, this equipment is installed on fueling facilities serving most of the world's major airports. It is approved and in production for the U. S. Air Force under recent contracts. For further information, write Aviation Products division, Warner Lewis Company.

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TABLE 1—RESULTS OF PILOT-PLANT RUNS

Sulfide, p.p.m.		Application rate,		Removal rate,	
In	Out	Phenol	Sulfide	Phenol	Sulfide
20	0.5	26.6	5.0	25.3	4.9
40	0.5	22.9	9.4	22.9	9.3
50	0.5	25.3	12.5	25.2	12.4
60	3.7	25.2	15.0	24.8	14.1

30-100 p.p.m., covering the levels generally found in dilute waste waters.

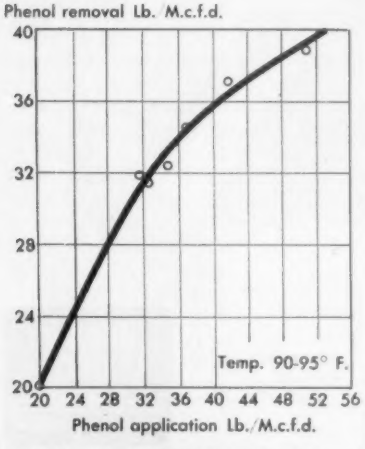
Following a short acclimation period to allow the biological growth to adopt to phenol alone, a series of tests was run to establish the capacity of the tower for phenol oxidation. These runs were made by setting a specific phenol load and then continuing operation until steady-state conditions were reached. Steady state was considered to be attained when phenol concentration in the effluent had remained constant for 3 days.

Fig. 1 shows the results. The break point for 99% phenol removal is about 32 lb. per M.c.f. of packing. Above this point lower removal percentages may be expected. At application rates of 40 and 50 lb. per day of phenol per M.c.f. of packing, removals of 90 and 78%, respectively, may be expected. Therefore, for 99% phenol removal at these very high loadings a secondary filter would be required.

Effect of sulfides. The pilot plant was modified to allow a solution of sodium sulfide to be pumped into the feed line at a point just before its entry into the recycle stream.

Operating conditions were maintained essentially constant except for the sulfide added to the feed stream. Phenol loading was about 25 lb. per M.c.f.d. Table 1 shows results of these runs.

Results indicate that the effect of sulfide on phenol removal is negligible up to sulfide concentrations of 50 p.p.m. At 60 p.p.m., the only effect was an increase to 3.7 p.p.m. sulfide in the effluent.



PACKING WILL REMOVE 99% of phenol in waste water at loadings up to 32 lb. phenol per M.c.f.d. Above this point a secondary filter is required. Fig. 1.

Packing inspection. At the end of the first year of operation the pilot plant was shut down and the packing inspected. It was in excellent condition. There was no evidence of deterioration or cracking, and a flexure test showed strength to be essentially the same as for new packing. The packing had been used in cooling-tower tests for 2 years before its use in this work.

Biological growth was distributed evenly over the packing and was a light brown color, indicating active growth; however, it did not grow on top of the packing decks. Growth was confined to the vertical section of the packing decks and did not extend beyond the protective overhang of the T-strips. This was probably because of the high hydraulic loads which lessened the possibility of the packing being plugged or fouled by excessive biological growth.

References

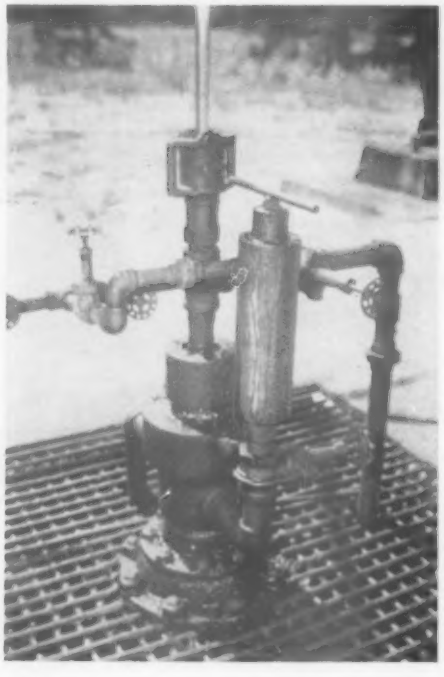
1. Bryan, S. H., "Moulded Polystyrene Media for Trickling Filters": Proceedings of the Tenth Industrial Waste Conference, Purdue University, 1955.

2. Fuller, A. L., Kohl, A. L., and Butcher, E., "A New Plastic Packing for Cooling Towers": Chem. Eng. Progress, October 1957.

3. Schulze, K. L., "Experimental Vertical Screen Trickling Filter," Sewage and Industrial Wastes, 29, 458-67, April 1957.

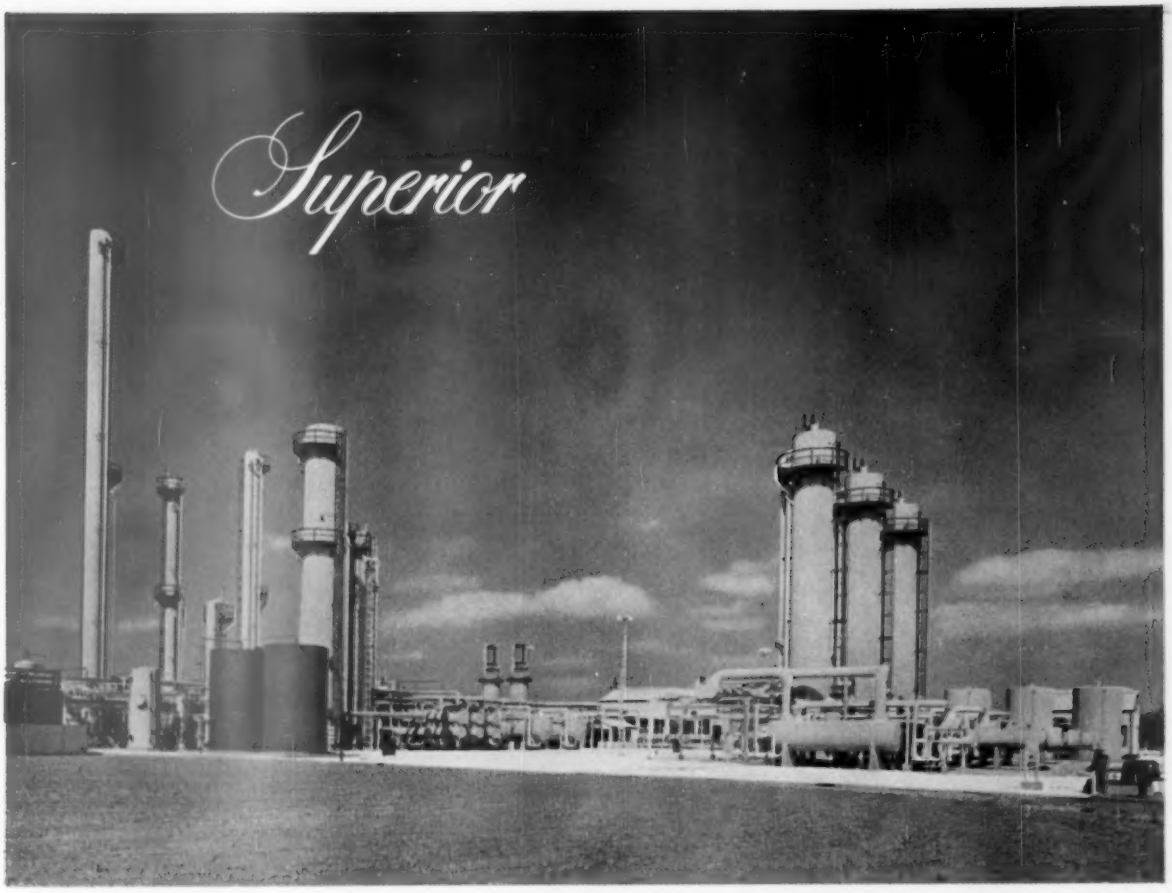
LEASE TIP

Flow-line connection helps add inhibitor



WHERE solid materials are used to inhibit corrosion of casing, tubing, and rods in a pumping well, a lot of trouble can be saved by simply pouring the powered material into a pot on the top of the casing and then turning the production through the pot to wash it down the casing.

The pot made from 4-in. pipe is easily connected to the side of the casing opposite the gas outlet. The top cap is equipped with a bar which allows the pumper to open the pot without a wrench. A 1-in. collar is welded to the side of the pot near the top and connected to the flow-line bleeder between two gate valves. After the chemical has been added, the flow line is shut off from the tanks for a few moments and the production turned into the casing to wash the chemicals into the annulus.



MORE THAN MEETS THE EYE

Pastel and bright color combinations used in this Hudson designed and built plant are utilitarian and also pleasing to the eye.

But beyond the eye appeal is the built-in 30 years experience of Hudson in building gas processing plants in most gas producing regions of the free world.

Such experience combined with constant alertness for improvements results in trouble-free plants, built on time, with careful balance between capital cost and operating cost to assure maximum return on the investment.

The above pictured absorption plant processing 300 million cubic feet per day of gas at about 1000 pounds pressure is located on the Mermentau River in Cameron Parish near the Louisiana Gulf Coast, and was designed and built for the Superior Oil Company.

A refrigerated absorption process is used with provision for future further refrigeration down to minus 50°F to increase gas throughput and/or product recovery. The plant has operated uninterruptedly since initial test start-up in October 1958.

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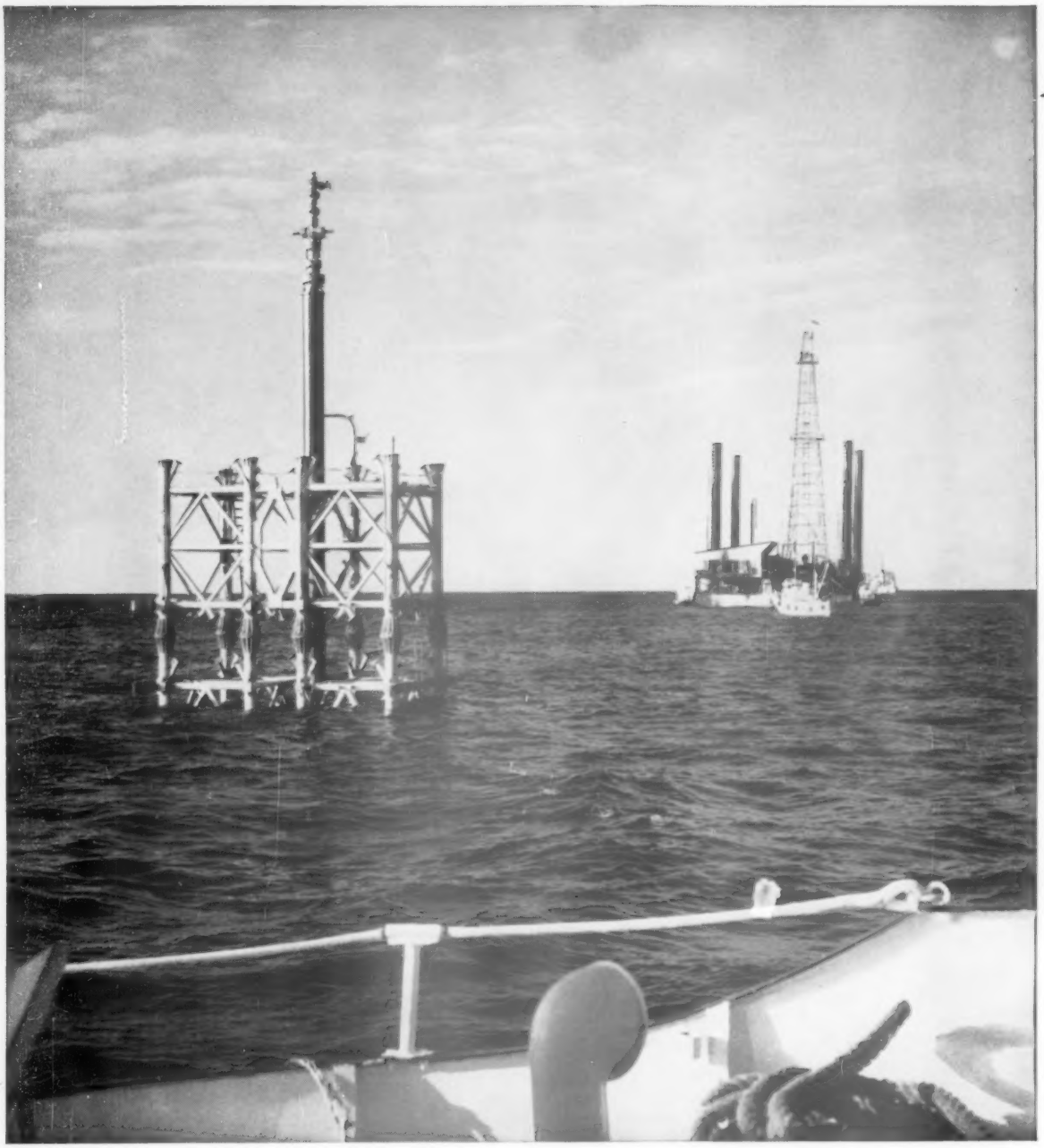


ABU DHABI

A well head in the Persian Gulf. In the background, the barge "Adma Enterprise" which is currently drilling beneath the waters of the Gulf. The results are sufficiently encouraging to warrant the preparation of facilities for regular production. This stage should be reached by mid-1962.

BP

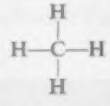
The

FOREMAN'S PAGE

Composition of hydrocarbons

HYDROCARBON is the name given to the large family of chemical compounds made up entirely of carbon and hydrogen. Crude oil is a mixture composed almost entirely of hydrocarbons, with a few other compounds like hydrogen sulfide (H_2S) present in some cases.

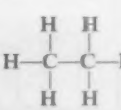
The simplest hydrocarbon is natural gas or methane.



One carbon atom is connected to four hydrogen atoms. In any compound made up of carbon and hydrogen the carbon atoms behave as though they had four arms and the hydrogen atoms behave as though each had only one arm. Each arm of the carbon atom must always be occupied, that is, it must be holding something, either a hydrogen atom or another carbon atom.

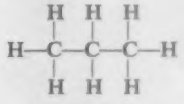
There are millions of different ways in which carbon and hydrogen atoms can be connected together to form hydrocarbon molecules. To make it easier to keep track of the different compounds, the chemist has divided these materials into several large families and worked out a naming system to help describe these compounds in a systematic way.

Paraffins. The first family or series of hydrocarbons is the paraffins. The simplest member of this series is methane. By adding one more carbon atom and two more hydrogen atoms, we can convert methane to ethane.



Ethane

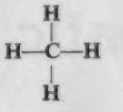
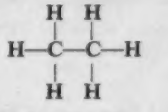
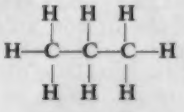
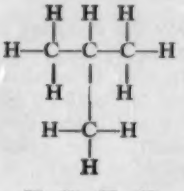
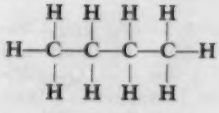
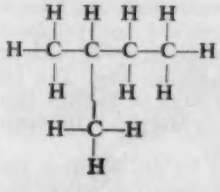
If we add one more carbon and two more hydrogens we have propane, the third member of the paraffin family.



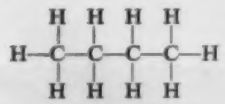
Propane

This material taken from process-training-program manual, Bayway, N. J., refinery of Esso Standard Division of Humble Oil & Refining Co.

FIG. 1—COMMON PARAFFINS

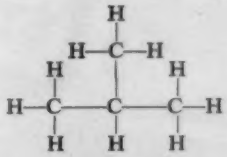
Name	Formula	Structure	Boiling point, °F.
1. Methane	CH_4		−259
2. Ethane	C_2H_6		−128
3. Propane	C_3H_8		−44
4. Isobutane	C_4H_{10}		11
5. n-Butane	C_4H_{10}		31
6. Isopentane	C_5H_{12}		82

When we get to 4-carbon members of the family, we find that there are two different ways we can put 4 carbons and 10 hydrogens together.



n-butane
(normal butane)

or



isobutane

Although both of these compounds have the same number of each kind of atom, they are quite different, having different gravities, boiling points, etc. As the number of carbon atoms increases, the number of different arrangements possible also increases.

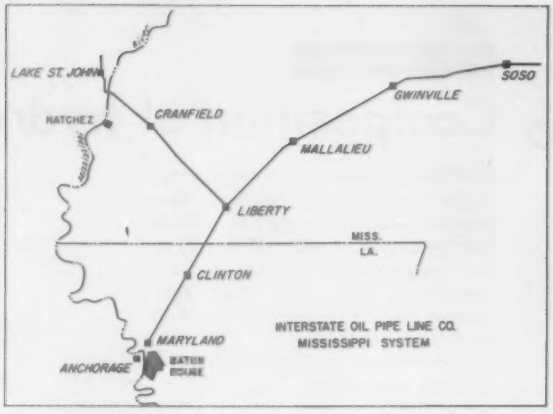
There are three five-carbon paraffins or pentanes; five hexanes or six-carbon paraffins; nine heptanes or seven-carbon paraffins; and, believe it or not, 366,319 different paraffins with 20 carbon atoms and 42 hydrogen atoms are possible. Most of these paraffins are of no particular significance, of course, but Fig. 1 shows the common ones up through isopentane. Note that the names of all the paraffins end in "ane." This identifies them as members of the paraffin family.

Here's an

Automatic pipeline

with

automatic batching



SIMPLE DESIGN TECHNIQUES are characteristic of Interstate's Mississippi system. Fig. 1.

INTERSTATE'S Liberty and Clinton stations are examples of how a fair degree of automation can be combined with system modernization using older equipment and simple design techniques.

In January 1959 the company decided to replace the existing engine station at Liberty with an automatic electric station and to install an electric booster station at Clinton, downstream from Liberty. The existing tankage and manifold at Liberty were to be retained.

The map shows Liberty and Clinton and their relation to Interstate's pipeline system in this area. Oil gathered in Northeast Louisiana and West Mississippi is received at Liberty through the Cranfield line. Oil from South and East Mississippi is received through the Mallalieu line. The oil from Mallalieu must be batched into Liberty and on to Maryland tank farm at Baton Rouge.

The necessity for this batching, the increased throughputs beyond the capacity of the existing engine station at Liberty, and the worn condition of the engines were the principal reasons for revising and automating this part of the pipeline system. The batching requirement made it mandatory to consider from the beginning the design of the system as a whole rather than as isolated stations. This design approach has other obvious advantages, of course.

Design Conditions

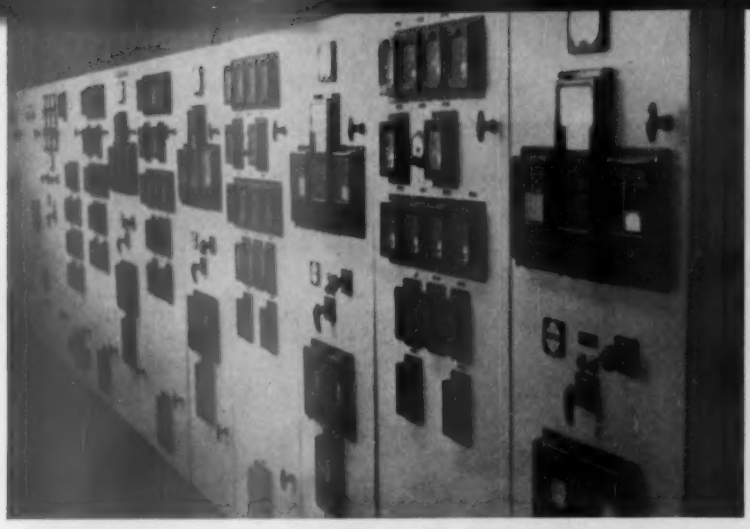
The following design conditions were set:

The capacity from Liberty to Baton Rouge was to be increased to the 1,440-psi. pressure limitation at Liberty by installing one 1,500-hp. motor and centrifugal pump and three 600-hp. units (uprated to 850 hp.) at Liberty, and a 900 and a 600-hp. unit at Clinton. The 1,500-hp. motor was a weatherproof motor from Interstate's Finney station near Shreveport. The 900 and 600-hp. motors were used indoor explosionproof motors which were fitted with protective shrouds over the bearings for outdoor service (Fig. 2). The high-voltage switch gear (Fig. 3) was rewired in the field for the desired automatic sequence and alarm system.

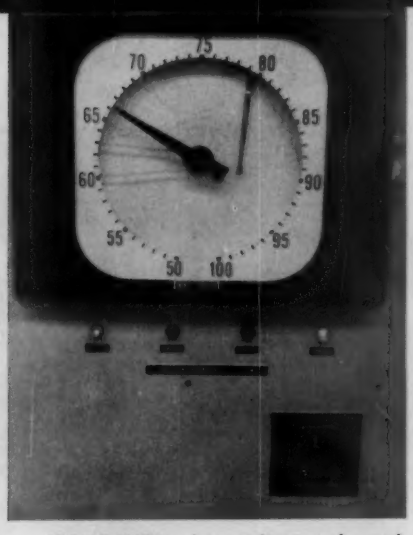
BY MARVIN HAMILTON

. . . electrical engineer, Interstate Oil Pipe Line Co. Hamilton was graduated from Texas A & M in 1951 with a BS degree in electrical engineering. He joined the engineering department of Interstate in 1953 and has served in numerous capacities within the department in the home office in Shreveport. He has also served as district engineer for Interstate at St. Elmo, Ill.

INDOOR EXPLOSIONPROOF MOTORS were converted for outdoor service by the addition of sheet metal shrouds. Fig. 2.



SWITCHGEAR was purchased, used, and rewired in the field. Fig. 3.



FRONT VIEW of recording stock totalizer and manual-demand limiting switch. Fig. 4.

The new stations were to be capable of the usual push-button station sequence and protective systems. The operation of a single push button starts a sequence of operations to perform all the functions necessary to bring the unit on or off the line automatically. Meanwhile, the motor and pump are monitored automatically for such malfunctions as overcurrent, vibration, seal failure, etc., and shut down and lock out on serious faults.

The next design requirement was that the new stations be built to push their own buttons—that is, program units on and off according to the quantity of oil to be pumped at the lowest possible cost for electric power. This programer was to take into account pump and pipeline efficiency, monthly throughput forecasts, stock already in storage, storage required for batching and storage available, and then run the minimum number of units possible.

Another factor to be included was a favorable "night rider" clause in the power contract for Liberty, providing reduced demand charges nights and on Sundays. The units at Clinton were to be started and stopped on pressure controls to run whenever adequate suction pressure could be provided from Liberty.

Motor-operated valves and batching controls were to be installed at the Mallalieu and Liberty stations to automatically segregate the two crudes to be batched all the way to Maryland terminal at Baton Rouge; there the oil was already being delivered through positive-displacement meters.

These meter readings were already being telemetered across the Mississippi River to Interstate's Anchorage terminal at Port Allen. Operators there were to monitor the operation of the new system by means of telemetered tank levels, pressures, valve positions, motor run-stop indications and emergency alarms.

Thus what was desired was an automatic pipeline system, within the limitations described, operating from built-in decisions-making machinery, independent of continuous attention by operators either at the stations or at the remote monitoring location.

We think that this is a significant point in that once the most economical or most advantageous way for a piece of equipment to operate under foreseeable conditions is determined, there is no need for an operator to figure it out all over again every day, whether he is physically at the station or at a remote monitoring point. In addition, such an arrangement is not so critically dependent on communications facilities.

The methods used to achieve these ends and the results to date will now be discussed in more detail.

Unit Sequence and Controls

The main-unit start-stop sequence is fairly conventional. The suction valve becoming completely open starts the discharge-valve opening, and the main unit starts when the discharge valve is approximately 5% open. The starting sequence is monitored by a sequence-completion timer, and a 60-minute no-recycle timer is energized to prevent cycling of the main motor in case of some malfunction of the automatic programer.

The units at Liberty go through this sequence in reverse when shutting down—that is, discharge valve closes to 5% open before shutting down the main motor and pump. This is to let the pressure at Clinton decrease gradually, to shut down with some positive pressure still on the suction of the Clinton pump.

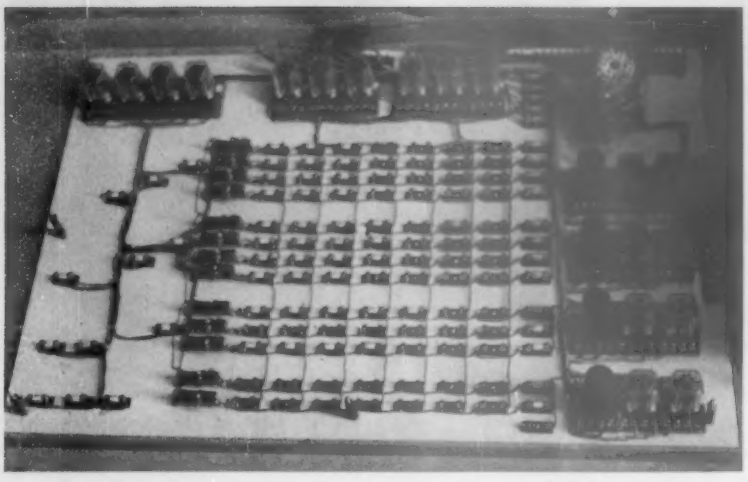
Bearing temperatures are monitored by a nonelectronic resistance bridge system which has proven to be very accurate and reliable. However, the only bearing failure to date was detected at an early stage by a vibration relay before enough heat was generated to actuate the temperature shutdown. This failure, however, was on

The author says . . .

We believe we have accomplished our original objective, which was to:

- Modernize our system and increase capacity by adapting available pumping and electrical equipment to our purposes, and
- Design controls to operate the pipeline system, including batching of crudes in and out of tankage, all automatically in an efficient manner.

Though the use of this available equipment and "home grown" controls has resulted in an installation lacking some of the polish of a package system, we believe that there has been no sacrifice in performance or flexibility.



DIODE MATRIX and control relays for station programer. Fig. 5.

a ball bearing, and no failures have been experienced on the motor sleeve bearings for comparison.

The same temperature-monitoring system monitors pump-case temperature. Seal-failure switches, with heaters to prevent paraffin buildup, are also installed. The motors are monitored for electrical faults with conventional switchgear relaying. The previously mentioned uprating of the 600-hp. motors to 850 hp. was on the basis of heat-rise tests made by the manufacturer at the request of the motor's previous owner.

Main-Unit Programer

The main problem was to continuously totalize the oil in three 55,000-bbl. tanks. This was done by installing potentiometers in the tank-gage line and connecting all three in series so that the total resistance would be proportional to the total oil in all tanks. These are added to d.c. bridge, round-chart, 7-day recorder with a full-scale range of 50,000 to 100,000 bbl. This stock totalizer, with the programer demand limiting switch, is shown in Fig. 4. Nine cam-operated microswitches on the back of this instrument provide switching actions at appropriate stock levels.

To best use the available tankage, these switches are wired through a five-position selector switch which provides a manually adjustable maximum-demand limit sufficient to accommodate the expected throughput. A schedule has been worked out with the power company so that its meters will be read before or after the switch is materially positioned on the first of the month depending on whether the expected pumping rate for the present month is to be higher or lower than the previous month's.

A 7-day time clock with 15 minute adjustment and day-omission provision is used to advance the programer one position at night between 9 p.m. and 7 a.m. and on Sundays. The four pumping units presently provide five pumping rates of roughly equal increments, with the Clinton units running when pressure permits. The 75 or the 100-hp. station booster pump at Liberty runs continuously any time a station manifold suction valve is open.

Perhaps the most unusual feature of the programer is a plug-in diode matrix (Fig. 5). This matrix permits practically unlimited flexibility for the automatic selection and operation of main pumping units for preset stock levels; it also provides for automatic substitution of the correct pumping unit (or units) if one of the main units should lock out on malfunction. This is useful to accommodate such factors as pump-impeller changes, etc., which require "reprograming."

These diodes energize a thermal time delay which is adjusted to provide the correct time delay on energization and deenergization to coordinate with suction and discharge-valve operating times; this provides a smooth transition when shutting down a small unit and starting a large unit or vice versa to change the pumping rate.

Automatic Batching

Of the approximately 65,000 bbl. daily of crude received from Mallalieu and an equal amount received from Cranfield, about 45,000 bbl. daily is a crude from Mallalieu which must be batched and segregated from the other Mallalieu crude and all the Cranfield stream. A shipper requirement was that this oil (hereafter referred to as "batch oil") would be in batches of at least 40,000 bbl. out of Liberty.

The oil is received into Mallalieu in separate tanks through separate pipelines so that it is necessary only to automatically alternate the station suction from one tank to another. This was done rather simply by motorizing two 16-in. valves and installing tank-gage limit switches in one tank so that as it fills, its suction valve opens, closing the other suction valve. This process is reversed when the tank empties.

A gravitometer (Fig. 6) installed at Liberty on the Mallalieu stream senses the approximately 4° API difference (Fig. 7) in gravity between the batch oil and the nonbatch oil as it arrives at Liberty. It causes filling valves to open and close to put the Mallalieu

GRAVITOMETER used for batch detection at Liberty station. Fig. 6.

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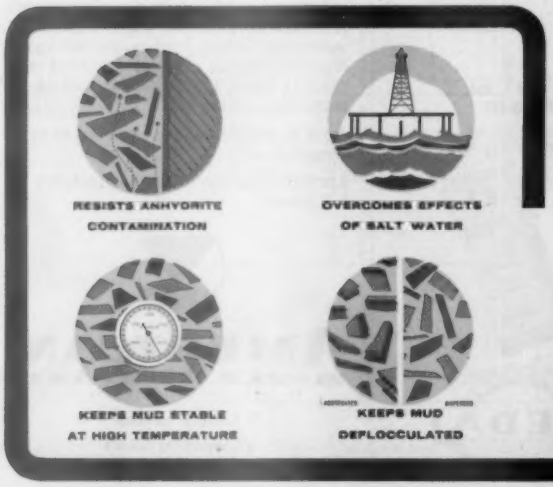
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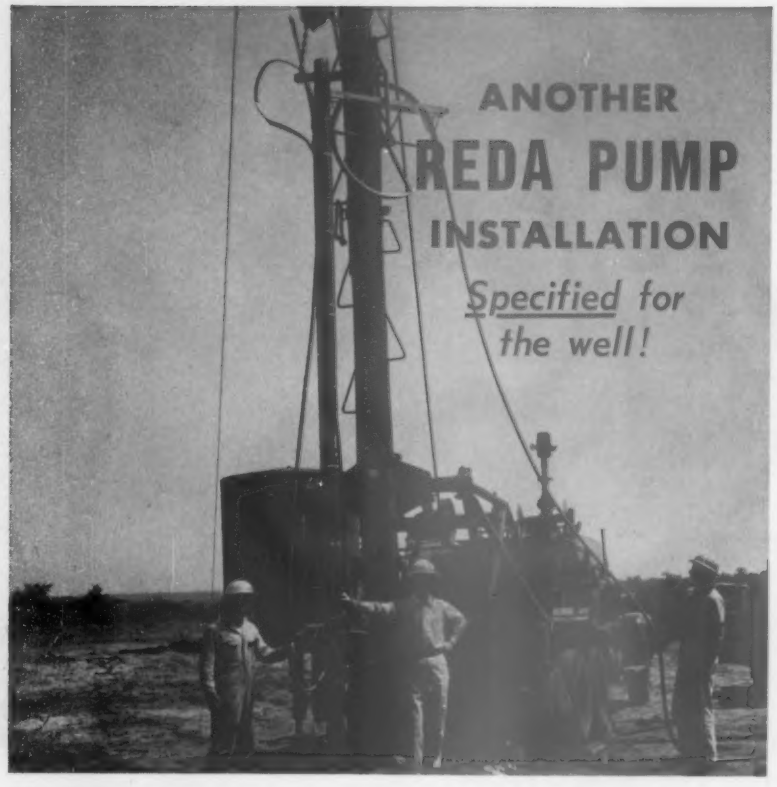

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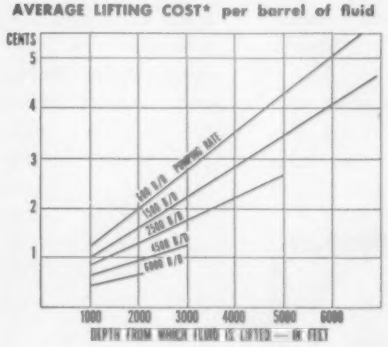

*Included: Electric Energy (10 Mills Per KWH), Run and Pull, Repairs, Upkeep, Transportation, Labor and Amortization (8 Yrs.)

Chart "A"

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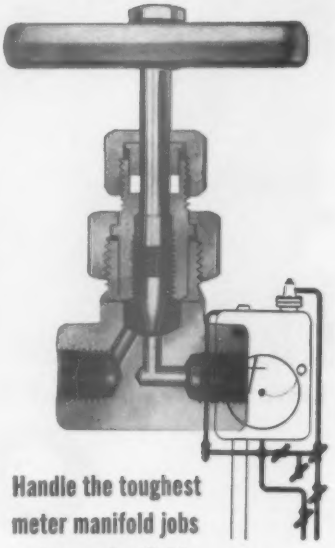

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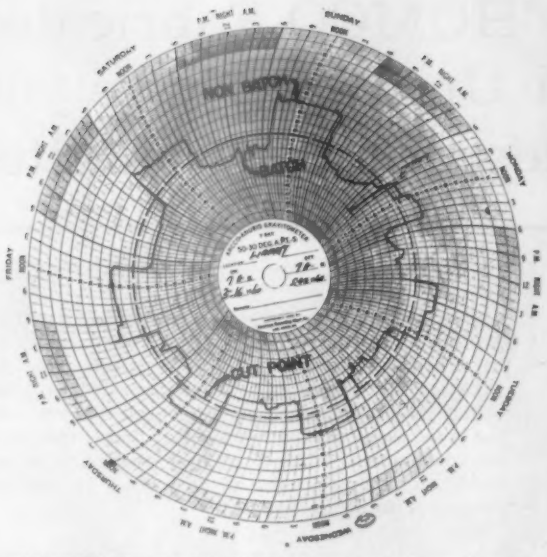
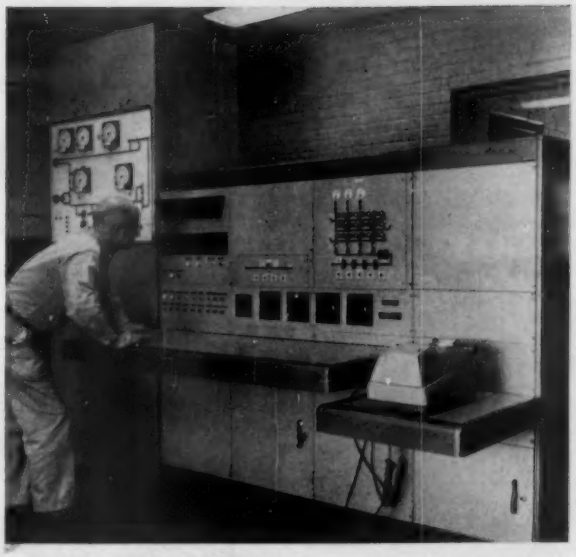


GRAVITOMETER 7-DAY CHART shows typical gravity variations and batch cut points. Fig. 7.



PRESSURES AND TANK LEVELS are printed each hour and on demand by datalogger at Anchorage station. Fig. 9.

stream into tank 188 or 210 according to whether the oil being received is batch oil or nonbatch oil. See Fig. 8 for a schematic of the tank and manifolding arrangement.

The Cranfield stream is continuously received in tank 210. Tank 189 is a cone-roof tank and is used as a secondary working tank for the nonbatch oil and as an emergency surge tank for either of the other tanks.

To insure the 40,000-bbl. minimum-batch size, tank 188 is made the control tank, and goes on suction when 40,000 bbl. has been accumulated. After 188 is pumped out, the station suction shifts to 210. When 210 is pumped out, the suction shifts to 189 if any oil had been accumulated in 189, and then after pumping out 189, back into 210 until a batch is again accumulated in 188. Tank 188 will break back into 189 or 210 any time 40,000 bbl. is accumulated.

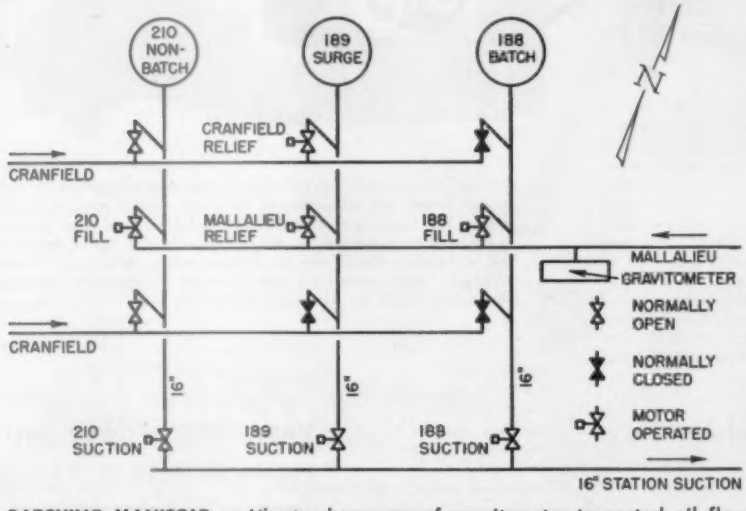
Emergency high levels in either 210 or 189 will cause the station suction to shift to 210. Station low suction pressure will cause the station to shift to 210 first before shutting down, since 210 is a higher tank and oil is always being received in 210.

The station suction and relief valves are operated by tank-gage limit switches and level probes.

The gravitometer switching scheme on the filling valves was installed and worked satisfactorily until March of this year, when a reclassification of some of the crudes caused the gravity difference at Liberty to drop to about 2° API. Because of the individual "slugs" of oil outside even this small difference, the gravitometer is no longer useful as a batch-detecting device.

For this reason, a displacement batching-control system is now being installed. A turbine-type meter is to be installed at Liberty, and receipts from Mallalieu will be registered on two mechanical counters. These counters will be alternately reset to zero over a leased telemetering circuit as one of the Mallalieu tank suction valves opens or closes, and when the line displacement has been metered into Liberty, appropriate filling valves will be switched.

This displacement principle is already being used to detect interface arrival at Maryland terminal at Baton Rouge. Positive-displacement meters used for custody transfer are combined electrically at Anchorage terminal and are registered on mechanical counters to give an alarm when the line displacement between Liberty and Maryland is metered. These counters are reset to zero as the suction valve on tank 188 opens or closes.



BATCHING MANIFOLD at Liberty shows use of gravitometer to control oil flow through proper tank. Fig. 8.

Telemetering

The main unit run-stop indications and critical valve open-close indications at Liberty and Clinton are displayed on a graphic panel at Anchorage (Fig. 9). Tank gages and discharge pressures can be individually gaged at any time from Anchorage. An adding machine-type printer automatically logs pressures, gages, and the time each hour. The only remote control provided is a permissive-run, crash shutdown control of Liberty or Clinton. The telemetering equipment was purchased as a separate item and installed by company electricians.

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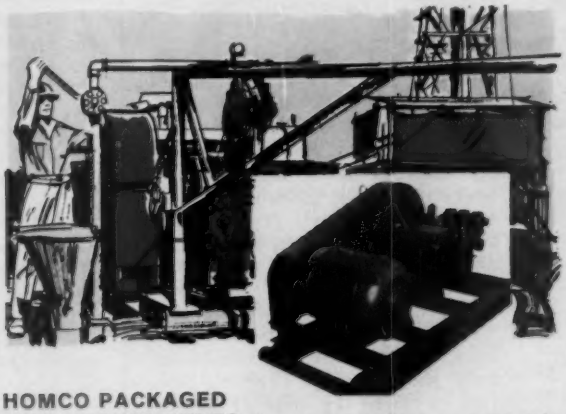

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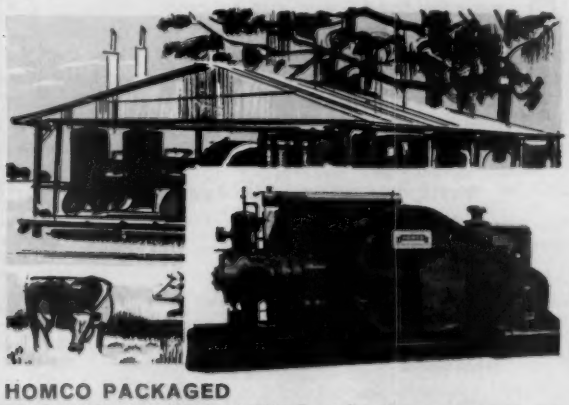

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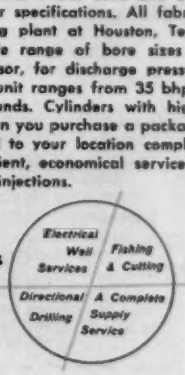


Cost of removing acid gases

. . . H_2S or CO_2

BY W. L. NELSON
Technical Editor and Petroleum Consultant

THE REGENERATIVE-TYPE processes employed in the removal of hydrogen sulfide and carbon dioxide from gases are much the same from a process standpoint. Such chemicals as mono and diethanolamine (Girbotol), potassium carbonate (hot carbonate), crude phenol and caustic (phenolate), tripotassium phosphate, and sodium arsenate (Thylox) are employed. The most widely used processes are probably the amine and hot carbonate processes, and these are the basis of the costs shown herein (Table 1 and Fig. 1). Even the costs of gas dehydration using diethylene glycol are quite similar to the costs found here for desulfurization. Processes in which the chemical is used up (at least in part) such as the caustic or lime-washing processes or the use of iron oxide or sodium carbonate, are not considered. Note that scrubbing with water can remove the bulk of acid gases as a preliminary step if clean water is abundant. However, the last and vital traces of acid gases must usually be removed by chemicals.

OPERATING COSTS OF PROCESSES

No. 27 Topping Plants, Sept. 22, 1958, p. 113.
No. 32 Atmospheric and Steam Distillations, Nov. 17, 1958, p. 187.
No. 35 Vacuum Flash, Dec. 15, 1958, p. 108.
No. 39 Vacuum Distillation, Jan. 26, 1959, p. 221.
No. 40 Fractionation Processes, Feb. 9, 1959, p. 121.
No. 43 Desalting, Mar. 30, 1959, p. 167.
No. 45 Thermal Reforming, April 13, 1959, p. 111.
No. 47 Thermal Cracking, May 4, 1959, p. 122.
No. 49 Caustic Washing, June 1, 1959, p. 180.
No. 52 Coking, July 13, 1959, p. 117.
No. 53 Gas Recovery Plants, Aug. 3, 1959, p. 109.
No. 54 Fractionation and Gas Recovery, Aug. 17, 1959, p. 225.
No. 56 Catalytic Reforming, Sept. 14, 1959, p. 93.
No. 59 Gas Compressor Stations, Oct. 26, 1959, p. 98.
No. 61 Polymerization, Nov. 23, 1959, p. 87.
No. 63 Refinery Compression Plants, Dec. 28, 1959, p. 173.
No. 65 Catalytic Cracking, Feb. 1, 1960, p. 129.
No. 67 Viscosity Breaking, Mar. 7, 1960, p. 105.
No. 69 Alkylation, April 1, 1960, p. 121.
No. 71 Decarbonizing or Deasphalting, May 9, 1960, p. 145.
No. 73 Desulfurizing of Oils, June 13, 1960, p. 116.
No. 79 Gas Desulfurization, September 12, 1960.

The operating costs of numerous processes such as solvent treating, gas cracking, treating, dewaxing, etc., will also be published.

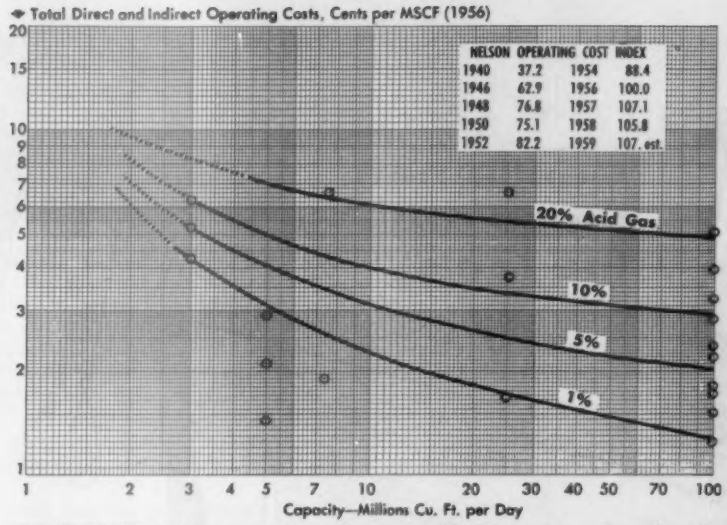
Labor, investment, maintenance and power costs are substantially the same for all processes. However, note that sometimes the gas plant in refineries is operated along with another process unit and thus the cost of operating labor may be half (or less) than the values of Table 1. The cost of chemicals is not great for the regenerative-type processes. Entrainment causes a loss of chemical and such losses are related to the pressure that is employed. The 1956 price of various chemicals is indicated in Table 2 as well as price indexes since 1953. Chemical costs are shown separately (Table 1) because the prices of chemicals change at a different rate than other operating costs. The Nelson Operating Cost Index for process units is also shown in Table 2 for comparison.

Example: The operating cost of a 10-

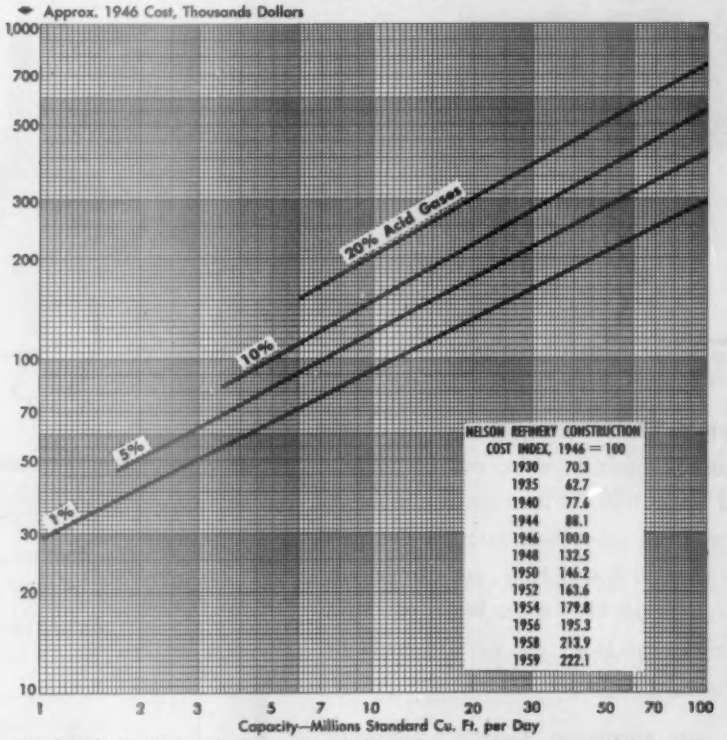
TABLE 1—ELEMENTS OF OPERATING COSTS—GAS DESULFURIZATION (OR CARBON DIOXIDE REMOVAL)

Element	Unit (somewhat standard)	1956 Unit Cost	Operating costs, cents/M.s.c.f.* Under 2% acid gases	5% acid gases	10% acid gases	20% acid gases	See Process Costimating number
Labor supervision	0.2-0.5 men/shift‡	$3.85/hr.†	0.2-0.5	0.2-0.5	0.2-0.5	0.2-0.5	26, 28, 41
Labor operating	1-2 men/shift‡	$3.12/hr.†	0.7	0.7	0.7	0.7	26, 28, 41
Maintenance	3-4%/yr. of replacement cost	$18-40 × 10⁶/M.M.s.c.f.§	0.1-0.2	0.2-0.3	0.2-0.3	0.3-0.4	29, 77, 80
Steam¶	3,000 lb./M.M.s.c.f./% acid gas	45-60 ct./1,000 lb.	0.2-0.4	0.7-0.9	1.3-1.8	2.7-3.6	17, 18
Water cooling	9,000 gal./M.M.s.c.f./% acid gas	1.7 ct./1,000 gal.	0.1	0.1	0.2	0.3	15, 16, 38
Power¶	(100 kw.-hr. + 10 kw.-hr.)/ M.M.s.c.f./% acid gas	0.85 ct./ kw.-hr.	0.1	0.1	0.2	0.3	13, 14, 21-23
Direct costs without chemicals (probable extremes)			1.4-1.8	2.1-2.5	2.8-3.5	4.7-5.5	
Chemicals	Amines 1-3 lb./M.M.s.c.f. or Pot. Carb. 2-6 lb./M.M.s.c.f.	28 ct./lb. or 9 ct./lb.	0.03 or 0.02	0.04 or 0.03	0.06 or 0.05	0.1 or 0.07	
			1.5-1.9	2.1-2.6	2.9-3.6	4.8-5.6	
Obsolescence, insurance, taxes, interest or dividends, replacement, etc., (10%/yr. of replacement)			0.5	0.66	0.82	1.1	1, 76, 82, 84, 86
Laboratory	0.2-0.5 men/shift	$3.12/hr.†	0.1-0.4	0.1-0.4	0.1-0.4	0.2-0.4	26
Other indirect costs			0.6-0.8	0.8-1.0	0.9-1.1	1.2-1.4	

*For plants handling 10 million cubic feet per day. †Average U. S. refinery wages plus 27% for all burdens. ‡For plants operated as separate units. Low shift labor for plants operated by independent refiners. Only one man per shift used here for 10-M.M.s.c.f. plant. §For 10-M.M.s.c.f. per day plants. Does not include investment in utilities. ¶Assuming all pumps are motor driven.



APPROXIMATE total operating cost of gas desulfurization (or carbon dioxide-removal) plants, cents per thousand standard cubic feet (1956). Fig. 1.



APPROXIMATE COST of plants (1946) for removing hydrogen sulfide or carbon dioxide from gases using amines or hot carbonate. Fig. 2.

million-cubic-foot plant during 1956 for a gas that contains 10% hydrogen sulfide is:

Direct cost without chemicals, cents per M.s.c.f.	4
Chemical cost (amine), cents	0.06

In 1953 the costs were (Table 2):

Direct cost (no chem.)	$4 \times 0.873 = 3.51$
Chemicals	$0.06 \times 1.087 = 0.065$

Thus, in 1953 the chemical cost was higher whereas other operating costs were lower.

The most important cost variable is the amount of acid gas impurity. This effect is indicated in Table 1 for gases ranging in impurity from 2 to 20%. An increase in cost arises mainly because of the cost of a greater circulation of solution for the impure gases rather than because of consumption of chemical. Fig. 1 retains the same variable but also introduces size of plant. The approximate investment costs of desulfurization (or carbon dioxide removal) plants is shown in Fig. 2. These costs are based on the year 1946 and costs at other years can be estimated by use of the Nelson Refinery Construction Cost Index.

References

1. Buck and Leitch, "CO_2 Removal from Natural Gas": The Oil and Gas Journal, Sept. 22, 1958, p. 99.
2. Carvlin, G. M., "Use of Sodium Phenolate for H_2S Removal": The Oil and Gas Journal, May 26, 1938, p. 56.
3. Culbertson and Connors, "How to Rid Natural Gas. . .": The Oil and Gas Journal, Aug. 11, 1952, p. 114.
4. Eickmeyer, A. G., "Acid-Gas Removal": The Oil and Gas Journal, Sept. 22, 1958, p. 106.
5. Mullowney, J. F., "Which CO_2 Removal Scheme Is Best?": Pet. Refiner, Dec. 1957, p. 149.
6. Powell, A. R., "Sulfur Removal . . .": Science of Pet., Vol. III, Oxford Univ. Press. 1938.
7. Riesenfeld and Mullowney, "The Giammarco-Vetrocoke Process . . .": The Oil and Gas Journal, May 11, 1959, p. 86.
8. Storrs, B., "Cost of Hydrogen Sulfide Removal . . .": Ind. Eng. Chem. News Edition, Vol. 17, No. 19, 1939, p. 628.

TABLE 2—PRICE INDEXES AND PRICES (1956) OF GAS-TREATING CHEMICALS*

	Arsenic Trioxide l.c.l.	Ammonia, anhydrous	Diethylene glycol, drums	Diethanolamine, drums	Monoethanolamine, drums	Potassium hydroxide 90%, drums	Potassium carbonate, bags	Phenol	Sodium carbonate	Sodium hydroxide	Nelson (Unit) Operating Cost Index
1953	1.150	0.989	1.180	1.087	1.080	1.000	1.030	1.063	0.901	0.848	87.3
1954	1.000	1.030	0.900	0.945	0.945	1.000	1.030	0.904	0.929	0.909	88.4
1955	1.000	1.030	0.960	0.977	0.977	1.000	1.030	0.929	0.943	0.943	91.5
1956	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	100.0
1956 Price† .	6.5	4.25	16.5	27.5	28.0	9.7	9.0	15.5	1.49	2.60	....
1957	1.000	0.983	1.000	1.000	1.000	1.030	1.010	1.032	1.043	1.036	107.1
1958	1.000	1.036	1.000	1.000	1.000	1.040	1.010	1.027	1.043	1.126	105.8
1959 est. ...	1.000	1.065	1.000	1.005	1.003	1.000	1.060	0.952	1.043	1.157	107.0

*Indexes for some of these back to 1934 appear in Process Costimating No. 58, Oct. 12, 1959, p. 186. †Cents per pound.

A Goodall Rotary Hose is over length. If it is damaged at the coupling, you don't have to replace it. Goodall will repair it good as new for $125—and you still have a standard API length hose. If the hose is crushed in the middle, Goodall will make a two-piece rotary hose from the damaged sections for $350. From a salvable Goodall Rotary Hose, you can get one or more API vibrating hose for as little as $125 each. When you have received all possible use from your Goodall Hose, you get $50 credit by simply returning the used set of Barney Couplings.

When selecting your next rotary hose remember: Goodall's Long-Life Rotary Hose is the best hose made for the high pressures and abuse that today's rotary hose must take . . . and no other hose offers such outstanding economy.

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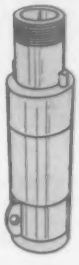

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Export: Goodall Rubber Company, Trenton, New Jersey.

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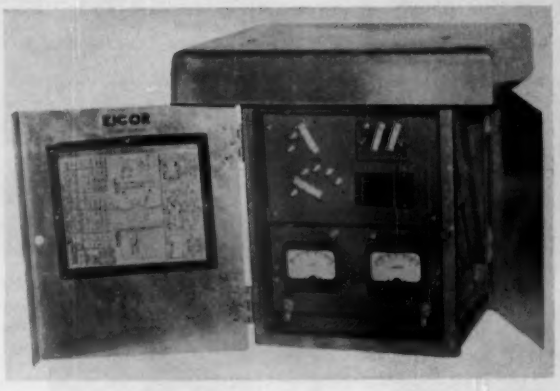
▶ ▶ ▶ New Equipment Section

This week's SHOWCASE features . . .

Rectifiers in four case sizes

. . . standardized by the manufacturer are available for cathodic-protection service. The Eicor rectifiers are produced in sizes to fit any one of four 11-gage steel-case sizes. The cases may be pole or platform-mounted. Wide swinging doors, which may be padlocked, give easy access to the equipment panel from the front or side.

Electrical fittings are provided for input power connection. A panel switch and overload protector are provided in the primary circuits. The units are designed for single-phase, 60-c.p.s., 115-volt a.c. power. Source: **Eicor Div. of Scranton Corp., 2225 Burbank, Dallas, Tex.**



Plastic pipe, fittings

. . . are available in sizes of ½ through 2 in. The pipe is made of high-density polyethylene and the fittings of polypropylene. The pipe is expected to prove valuable for piping such fluids as corrosive acids, brine, and alkaline solutions. It is tradenamed Poly III. According to the maker, the polypropylene resin fittings provide leaktight connections, are easy to install, and last a long time. Source: **Crane Co., 836 S. Michigan Ave., Chicago 5, Ill.**

Explosionproof fixture hanger

. . . promises to be useful to suspend fluorescent or incandescent explosion-proof or dusttight pendent lighting fixtures. The round body has threaded feedthrough hubs. The threaded hub leading from the bottom of the fixture stem is tapped and has a set screw to keep the conduit tight. To make wiring connections, simply remove the threaded cover. This exposes the wiring chamber.

The EFHC hanger comes with ¾ and 1-in. feedthrough hubs in combinations with ½, ¾, and 1-in. fixture-stem hubs. Source: **Appleton Electric Co., 1707 Wellington Ave., Chicago 13, Ill.**

Want more facts about equipment or copies of product literature described in this issue?

Send this **Showcase Coupon**

to manufacturer at address shown in bold type after each item.

Product name, Model no., literature title or number: .....

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Described in OIL AND GAS **JOURNAL** - Issue of **September 12, 1960**

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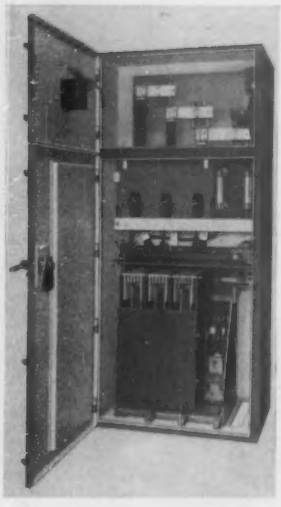

High-voltage air-break starter

. . . now available combines fuseless fault protection with simplified servicing. Certified interrupting capacity of the Type ZHA starter is 100,000 kva. at 2,400 volts and 150,000 kva. at 4,800 volts.

The phase barrier and arc-chutes slide out horizontally. This prevents rollout and provides easy inspection and upkeep. Both the front and rear contact tips are easy to get to. All maintenance can be done from the front. Thus, you can mount the starter against the well or back to back with another starter. A three-way door interlock protects personnel. With the door open you can see the blades in the open and grounded position. Source: **Square D Co., 4500 Lee Rd., Cleveland 28, Ohio.**

●

Temperature

. . . controller recently developed serves as an electronic on-off controller and as a temperature indicator, the maker says. Designed for processes requiring precise and continuous control, the Pyrotroller requires a space measuring 6¾ by 7 in. It comes in 11 ranges from 0-to-400° to 0-to-3,000° F. in single and double-target models. Source: **Alnor Instrument Co., 418 N. LaSalle, Chicago 10, Ill.**

●

Flow recorder

. . . announced recently, the Model 202A, is actuated by the maker's Model 199 ruptureproof meter body. The new case and recording mechanism include several new features: all internal parts are stainless steel, and the microlinearity adjustment on the torque-tube drive arm, as well as

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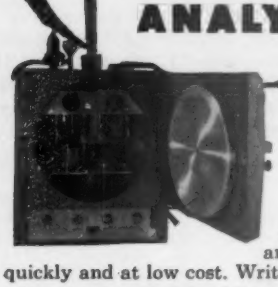

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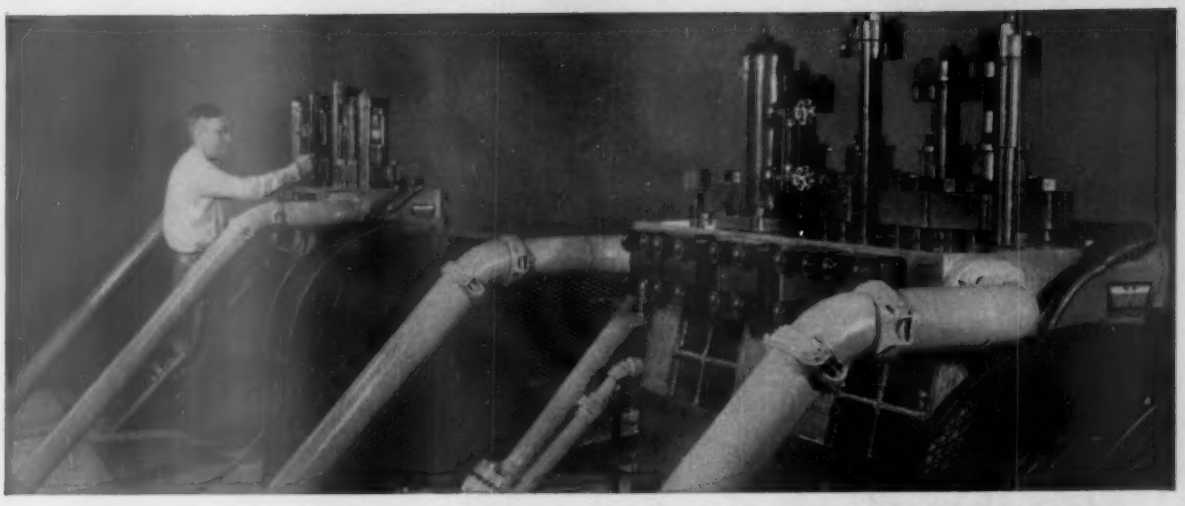

STOP AND SEE

Stop and see this Blackwell Oil & Gas Company installation at their North Happy Valley Unit, Cushing, Oklahoma. It's two Worthington vertical multiplunger pumps doing a good job of handling salt water disposal . . . currently injecting 5800 and 4500 BPD each.

Since startup in 1957, these two units have put away more than 8½ million barrels of corrosive salt water. Except for routine oil changes, maintenance has been limited to servicing valves and packing an average of once a year.

You say it's not close enough to home to see? Well, we'd still like you to see a Worthington power pump installation—and talk to the operator, too. Because there are so many of these installations, there's bound to be one near you. Just call your nearest Worthington office, listed in the Yellow Pages.

We'll arrange a visit—and you can decide firsthand whether these pumps could do the job you need. A complete line of injection pumps, both horizontal and vertical, from 15 to 3000 horsepower.

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L-K NEW ELECTRIC HEATING CENTRIFUGE

The L-K Pump Valve Company has introduced a line of new electric heating centrifuges for direct current use. Without sacrificing any of the features developed and proven through years of field use, the company has succeeded in making the new models more compact and lighter in weight. All aluminum construction is utilized and a new low profile several inches shorter than previous models is featured. Controlled heat is supplied to the cups throughout the spinning operation and both heat and motor switches are equipped with indicator pilot lights.

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the micrometer adjustments for zero and range, provide rapid and precise calibration, the maker claims.

The case is designed to operate under severe climatic conditions such as occur in field and offshore operations. Source: **Barton Instrument Corp., Monterey Pass Road and Thomas, Monterey Park, Calif.**

●

Matched V-belts

. . . are available in a complete line to meet the full range of the oil industry's needs. Three independent matching operations will be performed on all of the Crown V-belts between the plant and user to assure a match which exceeds standard specifications, the maker reports. Source: **Skinner Bros. Co., 641 E. Fifteenth, Dallas, Tex.**

●

New products

. . . for engine cooling now on the market have been developed specifically for stationary industrial engines with large cooling-system capacities. One of the products is Ambitrol FL, a full-fill cooling-system fluid consisting of ethylene glycol, deionized water, and a specially developed inhibitor system. The other is Ambitrol CN, a freeze depressant concentrate with an ethylene glycol base.

Ambitrol FL is designed to offer freeze protection down to —40° F. with protection against overheating up to 240° F. engine temperature. Source: **Dow Chemical Co., Midland, Mich.**

●

Integrated computer control system

. . . recently brought out combines instrumentation from the primary elements to final controls. The nucleus of the system is the maker's 290 digital computer. It is a general-purpose all-solid-state device designed for pipeline and process use. Features include high-speed internal operation, magnetic core and auxiliary magnetic drum memory, random access of input and output channels, and a special instruction "vocabulary."

Typical operating rates: 8,000 additions or subtractions, 1,250 multiplications, or 400 square-root extractions per second, including memory access time. Both binary and decimal arithmetic are used by the computer. Source: **Minneapolis-Honeywell Regulator Co., Wayne and Windrim Ave., Philadelphia 44, Pa.**

●

Roller chain

. . . has been disclosed which may provide substantial cost savings for operators of heavy construction equipment.

Called Tuf-Flex, the chain will deflect 4 in. either way from its normal plane and twist 8° in 4 ft. of chain to accommodate misalignment between sprockets resulting from the twisting of machine frames as they travel over rough terrain, the maker says. Source: **Diamond Chain Co., Inc., 402 Kentucky Ave., Indianapolis, Ind.**

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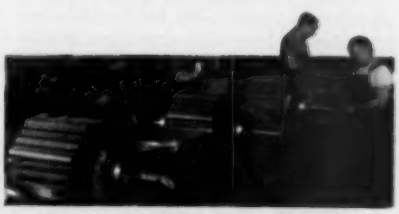

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SHOWCASE . . .

New Equipment

Industrial engines

. . . feature downdraft carburetion with a velocity governor. They have higher horsepower ratings than the maker's current models of the same displacement. The engines, series UR-372, UR-450, and UR-501, have six cylinders and maximum ratings from 165 hp. at 3,200 r.p.m. to the smallest to 212 hp. at 3,000 r.p.m. for the largest. Source: **International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill.**

●

Liquid extractor

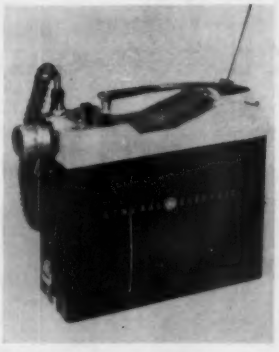
. . . now on the market obtains stage efficiencies of 98 to 100%, the maker claims. The Penn State-Esso extractor is of the mixer-settler type especially designed to solve complex extraction problems. Each stage can be sampled to obtain engineering data on optimum feed-point location, proper number of stripping and enriching stages, and optimum solvent treat and reflux ratio. You can also obtain data on composition gradients throughout the extractor, the maker reports. Additionally, the unit reportedly can produce extracts and raffinates in useful quantities for further evaluation studies. Source: **Pennsylvania Tool & Mfg. Co., Hartman & Wellington, York, Pa.**

●

New shaped charge

. . . for perforations in well completions with 4 and 4½-in. liners is now in field service. The "bull jet"-shaped charge is for use in 3⅛-in. o.d. steel case retrievable guns. It has been tested under 1,500-psi. fluid pressure at 180° F. with clearances of ½, 1, and 2 in. and with all targets and lab flow data complying with the proposed API standards for perforator evaluation. The maker reports the charges produced an outstanding record in the tests. Source: **Pan Geo Atlas Corp., Box 14524, Houston 21, Tex.**

●



Two-way radio

. . . with built-in charger on the market is designed so the battery can be recharged by using a car's cigarette lighter or an electrical outlet. A rechargeable nickel cadmium power supply enables the portable two-way radio to be placed on constant charge on a shelf while awaiting use.

Equipped with an all-transistorized receiver, the radio can be operated in the 25-to-54-mc. and 144-to-174-mc. frequencies. Thus it may be used to transmit to existing vehicle two-way radios, to pocket units, or to other portable two-way radios. Source: **General Electric Co., Box 4197, Lynchburg, Va.**

●

Multiple-orifice injection valve

. . . recently put on the market provides the precise adjustments of a needle valve but overcomes a needle valve's disadvantages of cutting and chattering, the maker claims. The valve meters fluids from a minute flow up to full line flow with less than a one-fourth turn of the stem.

According to the maker, the disk is capable of withstanding extremely corrosive fluids. The valve comes in either "L" or inline flange facings. Source: **Willis Oil Tool Co., 2451 Palm Dr., Long Beach 7, Calif.**

MACCO

DIAPHRAGM MOTOR VALVES

Both the Type "DC" and Type "S" Motor Valves have a 3,000 psi working pressure with 2" screwed connections. The diaphragm assembly, valve body, and inner valve are interchangeable. For easy field replacement the entire inner valve assembly may be removed and replaced as a unit by loosening the wing nut, without removing the valve body from the flow line and using no special tools or wrenches. The seat trims are constructed of stainless steel for most applications, or stellite for abrasive or high pressure drop conditions. Either valve can be changed in the field from reverse acting to direct acting by changing the insert type seat trim. All valves are cadmium plated throughout.

For further information, write for Motor Valve Brochure No. 8-02.

Type "DC" Motor Valve and Type "A" Time Cycle Controller

TYPE "A" TIME CYCLE PILOT

Available with 720-clip or 48-pin timing wheel, this pilot is used to automatically open or close a valve or valves on a preset schedule. Clocks are mechanical wind, gas or electric operated. A type "TPC" tubing Pressure Cutoff Pilot is an optional accessory.

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No scraping, cleaning, resurfacing or replacing flanges when installing new seal!—

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2

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Gask-O-Seals will not wear due to **pulse** or **vibration**. They last longer and are quickly and easily changed. **Sure, positive** sealing extends seal life. Fool proof installation reduces replacement time and repair.

3

Eliminate extreme hazard of "blow-out"—

Since Gask-O-Seals are **totally** confined with metal-to-metal contact of faying surfaces, the danger of a seal "blowing out" is completely eliminated under normal working conditions. This feature alone can save your company millions of dollars.

4

No retorquing of bolts necessary—

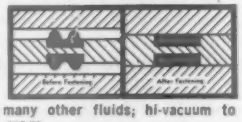
Once a Gask-O-Seal is installed there is no need to re-torque bolts. The seal can not "creep" or "cold flow." There is no need for tightening bolts to maximum, causing distortion of flanges. ..... the flanges are easy to break loose at time of repair or overhaul.

5

Re-useable—

Due to the carefully controlled mass-to-void ratio in the Gask-O-Seal design, the seal can not be over squeezed — its "memory" never destroyed by fastening pressures. They, therefore, may be reused several times with just ordinary care.

Plus — Due to low fastening torques required to effect a seal, flanges can be designed to greatly reduce mass and smaller bolts used, less bulky wrenches and tools are required and automatic equipment used for even faster installation. Gask-O-Seals will seal water, oil, air, hydraulic fluids, gases, gasoline and many other fluids; hi-vacuum to hi-pressure, in a very wide temperature range.



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PIPE LINE SURVEYS

SHOWCASE . . .

New Literature

Union-bonnet

. . . bronze gate valve identified as Fig. 3125, is outlined in a new four-page circular just made obtainable. Available in sizes ¼ to 2-in., the valve has a double-wedge disk and rising stem. The literature contains sectional views which detail valve features, along with a table of dimensions. Source: **Lunkenheimer Co., P. O. Box 360, Annex Station, Cincinnati 14, Ohio.**

Ultrasonic flaw detection

. . . is the subject of new Bulletin T200 which offers operation, techniques, and a list of specifications for the Sonoray 5 flaw detector. The eight-page bulletin discusses application of contact, immersion, and water-column testing methods. Source: **Branson Instruments, Inc., 40 Brown House Rd., Stamford, Conn.**

Cable-tool drills

. . . are detailed in a new 12-page bulletin now available for the asking. It gives descriptions of four models, including photos, specifications, and optional equipment for each. Also discussed are rotary attachments available to convert the models into combination rotary and cable-tool rigs. Source: **Buffalo-Springfield Co., 1210 Kenton St., Springfield, Ohio.**

Tubing manual

. . . details materials, size ranges, mechanical and physical properties, tolerances, lengths, specifications, material selection, and applications of mechanical, pressure, and aircraft tubing. Twenty-page Manual 60 details both seamless and welded tubing. Also included are shaped tubing, small tubing specialties, as well as a section on special finishes, custom tubing, and bimetallic tubing. Source: **Pacific Tube Co., 5710 Smithway St., Los Angeles 22.**

Fluid-flow-rate

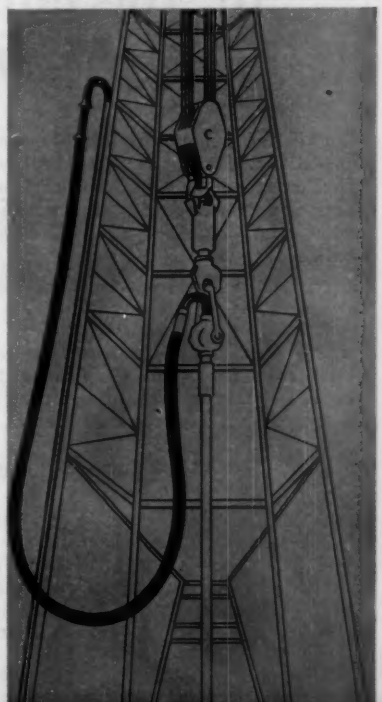
. . . alarms Bulletin 175, now ready for distribution, gives details and examples of rotameter accessories to provide signalling and simple control functions. Magnetic and electronic alarms are featured in the four-page publication, along with photos, opera-

REPUBLIC ROTARY HOSE

tool pushers agree . . . .

"NO KNOTS IN REPUBLIC HOSE!"

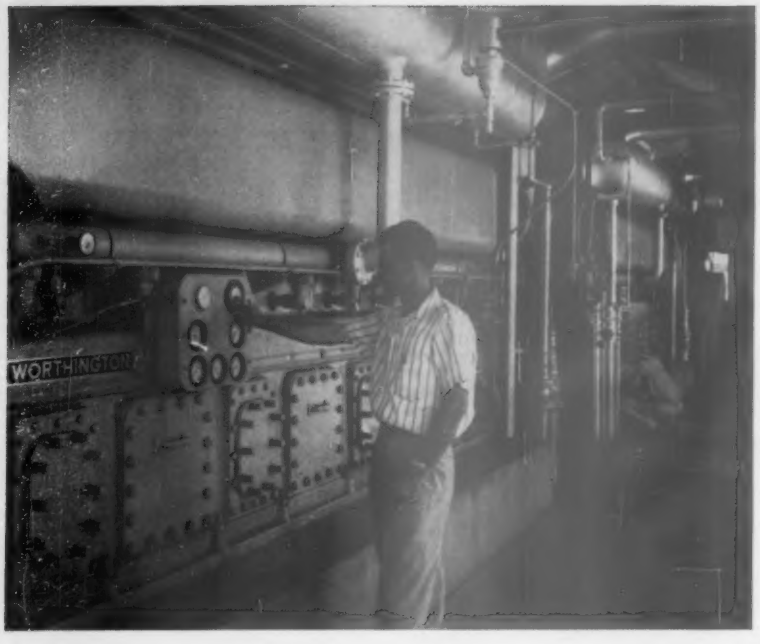
Equal tension on each steel cable prevents knots.



REPUBLIC RUBBER

DIVISION, LEE RUBBER & TIRE CORP.
YOUNGSTOWN 1, OHIO

For information on Rotary, Mud Pump Suction or Vibrator Hose, write to: Republic at Youngstown or check your local J & L Supply Store.

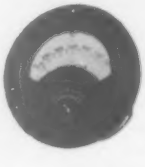


Like an extra supervisor on the compressors

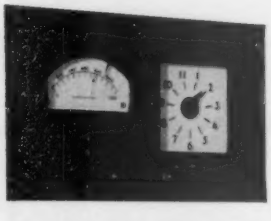
Alnor Pyrotac®

The Pyrotac is on the job 24 hours every day with unfailing engine protection. Improper injection, blow by, stuck rings, failure of cooling, overload, or other malfunctioning of the engine is immediately registered by the individual exhaust thermocouples and is indicated on the dial of the Pyrotac. When the instrument is set for the normal exhaust temperature range, any variation up or down shows up immediately on the Pyrotac dial.

Model FAX
a low cost manual operated multipoint pyrometer with capacity up to 16 circuits. Has splash proof case. Can be operated directly on engine or switchboard. Flush or surface mounting.



Motorized Pyrotac
gives a check on the operating efficiency of each cylinder by continuously registering the temperature of each exhaust. If the temperature varies up or down from a preset range, thus indicating a malfunctioning of any cylinder, an alarm is sounded to inform the operator so that the trouble can be spotted immediately. The motorized Pyrotac is available for indicating up to 20 circuits.



The low cost of the Alnor Pyrotac compared with the protection provided make its place on the control panel an indispensable safeguard. That is why many compressor power plants are now Alnor equipped.

Write for bulletin 4703

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Delta's Big Jets offer you the fastest, quietest, most luxurious flights ever!

DELTA
the air line with the BIG JETS

tion, drawings, features, and operation data. Source: **Brooks Rotameter Co., Hatfield, Pa.**

Industrial telemetering

. . . brochure now available, shows typical line costs and line capacities; describes in simple terms how the telemetering system works; and outlines typical systems. Detailed specifications are included. Source: **Ascop Div., Electro-Mechanical Research, Inc., Princeton, N. J.**

Figure

. . . industrial-truck costs with the help of a free "four-booklet library" which gives cost histories and do-it-yourself formulas for quick, accurate calculation and comparison of all expenditures.

The publications contain 62 pages of know-how covering every cost area of truck operation from purchase price to hourly oil expense. The do-it-yourself charts are folded in the booklets. Source: **Exide Industrial Div., Electric Storage Battery Co., Rising Sun and Adams Aves., Philadelphia 20, Pa.**

Steam-trap

. . . Catalog FE-310 provides 8 pages of detailed information about bimetal thermostatic and float thermostatic steam traps, available in a wide variety of pressure ranges, body patterns, sizes, and connections.

The steam traps are recommended for use on heat exchangers, instantaneous heaters, tanks (coil heated), vulcanizing presses, drying coils, relay points, terminal ends, and branch mains. Source: **MIL Div., Farris Engineering Corp., 402 Commercial Ave., Palisades Park, N. J.**

Tractors

. . . and construction equipment are featured in a new 16-page booklet now available gratis upon request. Thirty-three action photos show loaders, backhoes, dozers, earthcavators, fork lifts, cranes, and other industrial equipment in use with tractors. Source: **Tractor & Implement Div., Ford Motor Co., 2500 E. Maple Rd., Birmingham, Mich.**

New ultrasonic inspection service

. . . for refinery piping and vessels on steam, is detailed in a new six-page

Don't take chances on couplings

CHECK PUBLISHED MISALIGNMENT RATINGS BEFORE YOU BUY

Since misalignment is the basic problem that shaft couplings are designed to solve you'll find a published conservative misalignment rating (along with load capacity rating) for every Fast's Coupling. Compare it with the misalignment rating of any other coupling you are considering.
One further advantage of Fast's Couplings' misalignment ratings: You save money on installation because, knowing the ratings, you don't have to line up driving and driven elements with pinpoint accuracy. It's one more important reason why Fast's Couplings are the choice of more equipment manufacturers than any other gear-type coupling.
KOPPERS COMPANY, INC., 1409 Scott Street, Baltimore 3, Md.

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FAST'S COUPLINGS
Engineered Products Sold with Service

SPEED UP THE FLOW OF PIPELINE FLOW CHARTS WITH CHART-PAK TAPES

Chart-Pak tapes save you hours of drawing drudgery. You don't ink-in or paint lines, bars, shapes and symbols. You tape them on . . . fast . . . with Chart-Pak pressure-sensitive tapes and sheets!

Corrections are easy with Chart-Pak, too. There's no such thing as a mistake you can't fix . . . a change you can't make. If a line or symbol is in the wrong place, you can lift it up and replace where you want it.

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Write for free folder — "Visualization Made Easier."
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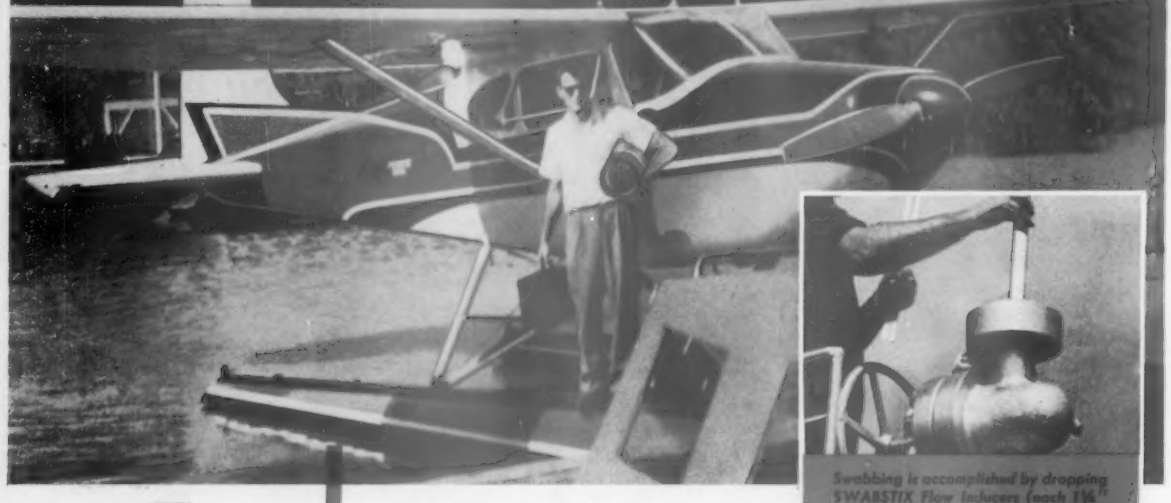
CARRY YOUR WELL SWABBING "RIG" UNDER YOUR ARM!



Swabbing is accomplished by dropping SWABSTIX Flow Inducers (each 1¼" in diameter and 24" long, packaged six to a carton) down the well tubing.

New Swabstix *Flow Inducers*

SWABSTIX* Flow Inducers, unique new products developed through Tretolite research, now make it possible to restore oil flow in fluid-logged wells through *chemical* swabbing. Remarkably easy to transport and use, they offer obvious advantages over conventional mechanical rigs, particularly when wells are difficult to reach, such as in offshore or bayou locations.

Enough SWABSTIX Flow Inducers for a complete well treatment can be carried anywhere by one man. Swabbing requires no additional help, no special tools or equipment. No other method is as fast and convenient.

Each SWABSTIX Flow Inducer unit consists of a water-soluble, oil-insoluble plastic cylinder filled with a powdered chemical. The cylinder is dropped down the fluid-logged well tubing and remains intact while traveling through the oil column. Upon reaching the water phase, the stick dissolves. The released chemical rapidly generates gas by reaction with water. This gas increases in volume and reduces the density of the well fluids. As the gas expands and moves toward the surface where pressures are lower, flow is induced.

SWABSTIX Flow Inducer components are (from left), unit package, outer polypropylene tube and cups, chemical unit, water-soluble tube and end cups.

Ask the Man in the Red Car *to explain more about the use of this new Tretolite product, or write for the* SWABSTIX *brochure just published.*

**Trademark of Petrolite Corporation*

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55-60-2

folder just made obtainable. The Ultragauge inspection system is said to be capable of checking thousands of feet of refinery tubing each day. Accuracy is 0.005 in.

The publication reports that inspections can be performed for corrosion and erosion pitting, cracks, and hidden flaws within the pipe wall on hot lines on stream at temperatures greater than 1,000° F. Source: **International Inspection, Inc., 1728 Old Spanish Trail, Houston, Tex.**

Airless spray-gun

. . . bulletin now available, describes the H-Gun and offers features, photographs, spraying systems and pump specifications, and applications. The four-page literature piece includes a full page of details on accessories. Source: **Spee-Flo Co., 6614 Harrisburg, Houston 11, Tex.**

Information on clamps

. . . for hose, plastic pipe, and varied industrial applications is contained in four-page Bulletin 1-103. It illustrates and describes a clamp with an interlocking grip, a swivel-action unit for simplified inventory and positive clamping, a multiduty strap clamp, and a one-piece preformed economy type for small hose.

Photos and detailed dimensional drawings are included. The bulletin also gives construction details, recommended uses, and statistical data. Source: **Ideal Corp., 435 Liberty Ave., Brooklyn 7, N. Y.**

Steel grating

. . . and treads catalog presents 12 pages of engineering data on Weldforged steel grating. The publication offers a new arrangement of conventional, close spaced and stairtread data designed to help you find any particular type quickly. Included are tables of safe loads and weights. Source: **Kerrigan Iron Works Co., Box 479, Nashville 2, Tenn.**

Control-valve catalog

. . . presents 16 pages of engineering, specification, and purchasing information on cast, barstock, and special valves, which are supplied in sizes from ¼ to 14 in., for pressures from high vacuum to 50,000 psi. and temperatures from —425° to 1,800° F. Catalog GV-101 features P-K Paul control valves of venturi-ball design. Source: **General Kinetics Corp., 197 S. Van Brunt St., Englewood, N. J.**

Standardize with WECO Unions on all your piping for leakproof connections and simplicity of make-up. When you standardize with WECO Unions no time is lost in locating matching unions. WECO Unions in same sizes and pressures not only match perfectly with each other but are unsurpassed for making and holding a tight seal under all conditions of surge and vibration.

Full circle contact of the ball and cone metal-to-metal seats always makes a tight seal.

Save money and time, standardize on WECO Unions, proved best on the hardest service applications. At your Supply Store in sizes 1" through 12", pressures 1,000 psi through 15,000 psi.

U-6-60

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HOUSTON, TEXAS

WECO

Division of CHIKSAN COMPANY a subsidiary of FOOD MACHINERY AND CHEMICAL CORPORATION

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▶▶▶ Equipment Men Notes

Ivan R. Blauser, Jr. becomes

. . . a sales representative, working out of the store area at Pikeville, Ky., for U. S. Steel's Oil Well Supply Division, reports J. P. O'Toole, eastern area manager. Blauser joined Oilwell in 1953 at Mt. Carmel, Ill. as a junior engineer.

He was transferred to Carmi, Ill. as district representative the following year and became assistant district engineer at Parkersburg, W. V. in 1955. He has served in the same capacity at Beattyville, Ky. since that time.

Wilson Supply Co. announces

. . . two management changes in its Fishing Tool Division. W. H. Newman has been elevated to general manager, and B. M. (Skip) Scivally,

W. H. Newman

B. M. Scivally

former manager, has been promoted to manager of the research and fishing-tool-development program.

Newman had been sales supervisor for the Fishing Tool Division and, prior to joining Wilson, was division drilling superintendent for Magnolia Petroleum Co. He was with Magnolia for 37 years.

Scivally, a 20-year veteran with the division, came to the Gulf Coast area as a fishing-tool operator in 1934. Prior to that he was engaged in drilling and fishing operations in Oklahoma and California.

Gustav A. Hoffman named veep

. . . in charge of sales of Walworth Co. He is returning to the company he served for 27 years. He left last year while holding the post of assistant vice president in charge of metropolitan division sales.

Hoffman joined Walworth in 1932. He entered company sales 4 years later and was appointed sales manager of the Philadelphia area in 1940. He later managed the Kansas City and Detroit sales areas.

THREE PRESIDENTS representing more than 47 years of Byron Jackson service are shown at the retirement of E. S. Dulin (left). Dulin headed the company from 1929 until 1958, and has been chairman of the board since 1945. John B. Keating (center) was president from 1913 until 1929, and Andrew W. Rose (right) has been president the past 2 years. The photo behind Dulin is of Byron Jackson, founder and company president from 1872 until 1913.

Baker Oil Tools, Inc. appoints

. . . three new branch managers. B. J. Gass will head the new office in Citronelle, Ala. Gass goes to Citronelle from Laurel, Miss., where he was a sales and service engineer.

J. H. Graham will take charge of another Baker branch—this one in Rio Vista, Calif. Graham has been a member of the Baker organization for over 6 years. New branch manager at Falfurrias, Tex. is J. J. Laws, an 8-year Baker employe. He has served the firm in Corpus Christi, Falfurrias, Luling, and Beaumont.

Plastic Applicators, Inc. adds

. . . James Cliburn, Ralph Murphy, and Glen Tanner, Jr. to its sales engineering department. Cliburn and Murphy will be assigned to the Texas Gulf Coast area, making headquarters in Houston, while Tanner will work in Lafayette, La. with the firm's drill-pipe and tubular-goods-inspection division, Pipe Inspectors.

Cliburn has a 15-year background in the petroleum industry, including experience in completion work, corrosion control, and production. He was formerly with Atlantic Refining Co. and Otis Engineering Co. Murphy has worked with Clegg & Hunt Drilling Co. and Mayronne Mud & Chemical Co. Tanner's industry experience encompasses both domestic and foreign oil operations is association with Humble Oil & Refining Co. and Coastal Service Co. in Maracaibo, Venezuela.

Jones & Laughlin Supply makes

. . . two changes in its field sales force, announces W. L. Wolfe, vice president in charge of sales. C. W. Thurmon, assigned as salesman in the Shreveport office, previously worked in the same capacity at El Dorado, Ark. N. A. Myers was promoted from sales trainee to salesman at Lake Charles, La.

Thurmon joined J&L as storeman-advanced at El Dorado in 1953, and was promoted to salesman later in the year. Myers entered the division's sales training program in 1958.

Larkin & Co., Inc. transfers

. . . its production facilities from Butler, Pa. to Wellsville, N. Y. The company will operate under a new name—Butler-Larkin Co., Inc.—and will continue to manufacture its present line of oil, gas, and special well-production equipment.

Larkin maintains branch offices and warehouses in Parkersburg, W. V., Olney, Ill., and Bartlesville, Okla. Other warehouse stocks are made available in Texas and Florida. Sales are made through supply stores and commission houses both domestic and abroad.

Charles B. Leber is appointed

. . . advertising manager of Caterpillar Tractor Co., succeeding Burt M. Powell, announces Lee Morgan, sales development manager. Powell, who recently retired, held the post since 1953. Replacing Leber as manager of

C. B. Leber

B. M. Powell

the sales division of the defense products department is Frank S. Foster.

Leber, who joined Caterpillar in 1947, held various supervisory positions in sales work, including district representative, assistant sales manager, and sales training manager. He was appointed manager of the sales division of defense products last year.

Powell has been employed at Caterpillar since 1935. After 2 years as a company news writer, he became the first editor of News and Views, the company's employe magazine. In

1945 he was appointed manager of sales publications. Powell became assistant advertising manager in 1948 and advertising manager in 1953.

Foster, a Caterpillar employe since 1945, had been sales administrative assistant since 1956.

Milwhite Mud Sales Co. names

. . . James N. Statton as area sales manager with headquarters in Midland, Tex. After joining Milwhite in 1953 as a mud engineer on the Texas Gulf Coast, he worked in New Orleans as a city salesman. Statton was transferred to Midland in 1959 as a member of the West Texas division sales force.

L. A. Brewer named to head

. . . a new post of Wolverine Tube Division of Calumet & Hecla, Inc., according to R. C. Crowe, manager of product sales. Brewer, who takes over as manager of sales administration, joined the company as sales representative in the New York district in 1959. His most recent assignment was as manager of strubing sales, a position now occupied by Carl T. Fuller, former sales manager of Chicago district.

Fuller's position carries the responsibility of managing the sale of many of the company's latest developments on a national basis. He started with the firm in 1947 as a time-study engineer, and since then has served in various field sales capacities.

Allis-Chalmers reports changes

. . . in its control department. R. C. Bown takes over as sales manager succeeding G. G. Brooks, who has been transferred to Allis-Chalmers' associate company, Consolidated Systems Corp., Monrovia, Calif., where he will be in charge of industrial systems. Succeeding Bown as manager of the A-C rectifier section is W. G. Williams.

Bown has been with the manufacturing company since 1946. He was a sales representative in the St. Louis district; manager of the Evansville district; manager of General Products Division sales, midwest region; and assistant manager of the rectifier section before becoming manager of the section in early 1960.

Brooks was supervisory engineer for standard starters from 1955 to 1958, when he became manager of product sales in the control department. Williams was a sales engineer in the industrial systems department and in the

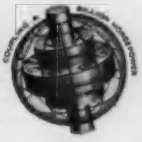
MANY FAST'S HAVE BEEN WORKING LONGER THAN YOU

It's a fact. There are plenty of cases where Fast's Couplings have been in service 20 to 40 years. And some of our more enthusiastic engineers say a Fast's should last forever if it's properly applied, installed and lubricated. Whatever opinion you accept, you can bet Fast's Couplings will give you the same smooth-running, low-maintenance, long-lived performance that makes them the choice of more equipment manufacturers than any other gear-type coupling.

For example, Fast's Coupling No. 1347, shipped in July, 1922, is still in service—and the customer is just ordering his first spare coupling 38 years later.

KOPPERS COMPANY, INC., 1409 Scott Street, Baltimore 3, Md.

KOPPERS **FAST'S COUPLINGS**
Engineered Products Sold with Service



Mild Steel Outlasts Stainless!

The Colmonoy Spraywelder applies powdered nickel-base alloys smoothly and quickly. Overlays are then fused and ground.

Left: mild steel sleeve with Colmonoy No. 6 overlay after 395 days service. Right: stainless steel (316) sleeve after only 105 days service.

COLMONOY HARD SURFACING CUTS PUMP SLEEVE WEAR

Much longer wear and fewer packing changes are the results reported in using Colmonoy hard-surfaced mild steel pump sleeves in a Desalta charge pump where stainless steel sleeves were used before. Maintenance costs are now considerably lower. Compare the two pump sleeves in photo.

Colmonoy alloys and methods can protect your equipment, save you money. Write for the Spraywelder Catalog and the Colmonoy Hard-Surfacing Manual today.

HARD-SURFACING & BRAZING ALLOYS

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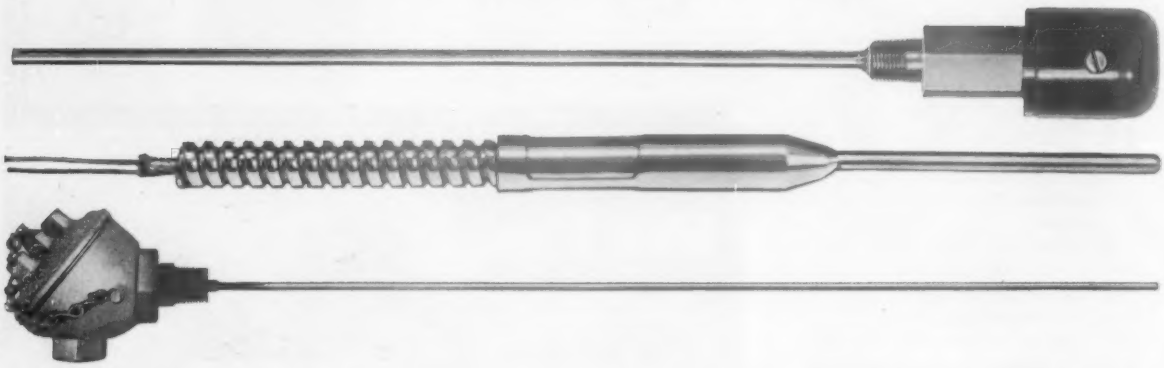
CHOOSE FROM 150,000 STANDARD *MegopaK* SMALL-DIAMETER THERMOCOUPLES



If you've been looking for small-diameter, flexible thermocouples with high speed of response, search no more. You'll find exactly what you need in Honeywell's *MegopaK** line.

MegopaK is a combination of thermocouple wires, mineral insulation and a protecting sheath, compacted into a solid mass with a diameter as small as 1/16". You can get *MegopaK* in standard lengths up to 25 feet, and in lengths up to 50 feet on special order. They're available with copper-constantan, iron-constantan and *Chromel-Alumel*** calibration. In all, there are more than 150,000 standard combinations of materials and fittings. These top-quality thermocouples are supplied in bulk, and as elements with wires welded into a measuring junction, or as complete assemblies.

*Trademark, Minneapolis-Honeywell Reg. Co.

**Trademark, Hoskins Mfg. Co.

MegopaK assemblies come complete with terminations (heads, plugs, etc.) and mounting attachments. Also available are special configurations, tests, material and calibration certifications.

MegopaK thermocouples and other pyrometer supplies are stocked at our Los Angeles and Dallas depots as well as in Philadelphia to give you the fastest possible service anywhere in the country.

Check with your nearby Honeywell field engineer for complete details, or write for Catalog G100-4.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa. —In Canada, Honeywell Controls, Ltd., Toronto 17, Ontario.

Honeywell

First in Control

SINCE 1885

75th YEAR PIONEERING THE FUTURE

rectifier section before becoming engineer-in charge of induction and dielectric heating sales in 1957. He was named manager of product sales in the rectifier section earlier this year.

Kinder Chambers is promoted

... from district engineer to a staff service engineer in the drilling-mud department, marketing division, of Magnet Cove Barium Corp., reports I. W. Hoskins, senior vice president in charge of marketing. Chambers will transfer from Houma, La. to Magcobar's Houston office and will assist the chief service engineer in training company field engineers in the use of drilling-mud products and engineering techniques.

He joined Magcobar as a sales and service engineer in March 1954, serving at various locations in South Louisiana until being appointed district engineer at Houma in 1957.

American Meter Co. appoints

... two recent graduates of the company's 6-month gas-measurement school, at the Erie, Pa. plant, to sales-representative posts in Philadelphia and Chicago. The announcement comes from C. B. Dushane, Jr., vice president of sales.

Alfred S. Erwin will make headquarters in American Meter's central sales department in Philadelphia, and Henry H. Mayer will cover the midwest sales division, working out of Chicago.

Plastic Applicators, Inc. expands

... services of its Cementcap Division at Odessa, Tex., and names Harold Harkrider as manager. Harkrider has served as sales engineer for Plastic Applicators in the Midland, Tex. area and in Hobbs, N. M. His experience in production techniques and corrosion control extends back 8 years and includes work with Phillips Petroleum and Sivalls Tanks.

Cementcap, a special cement-lining service developed by Plastic Applicators for pipe and tubular goods, recently added portable cement-lining units at its Odessa plant.

Delta Tank Mfg. Co., Inc. names

... Winston O. Shook and George H. Barnes as sales representatives in the Corpus Christi branch, announces B. W. Bourne, Delta's vice president and western regional operations manager.

Shook is a veteran of 12 years in the industry, serving as sales representative and branch manager for petroleum-equipment companies. Barnes has been active in oil-field-equipment sales in Louisiana and Texas prior to joining Delta.

Lloyd A. Alaback becomes

... a sales representative for Young Radiator Co., Racine, Wis., and will promote the sale of jacket water coolers, evaporative coolers, and HC air-cooled coolers and condensers in the Tulsa area. Alaback heads Thermal Engineering Co., of Tulsa.

Two complete training program

... in Los Angeles, of Axelson Division of U. S. Industries, Inc. Recent graduates are Charles Welch, assigned to the Rocky Mountain region, and Dick White, sent to the Mid-Continent, according to L. G. Evans, vice president of sales.

The program instructs young engineers on modern production methods and techniques used today. In addition, students are exposed to various functions of engineering, manufacturing, purchasing, and internal sales operations.

C. E. H. Verity becomes director

... of Foster Wheeler Corp., builder of oil refineries, process plants, and steam-power-plant equipment. Verity is managing director of the corporation's largest subsidiary, Foster Wheeler, Ltd., London, England.

Bill Proctor becomes manager

... of Republic Supply Co.'s Oklahoma City store, according to C. J. Jump, general sales manager. Proctor was with National Supply Co. for 10 years before joining Republic. Most recently he was Republic's city sales representative in Oklahoma City.

Jump also announced the transfer and appointment of K. L. Maxwell from city sales representative in Denver to the same post in Oklahoma City, replacing Proctor. Since joining Republic in 1955, Maxwell has served as floorman, field sales representative, store manager, and city sales representative.

Southwest Industries announces

... it is now manufacturing and distributing packaged units for producing elemental sulfur from gas streams containing hydrogen sulfide. The Houston company recently concluded negotiations with Tears Engineers, of Dallas, who are licensed by Pan American Petroleum Corp., whereby the units will be manufactured in accordance with Tears designs.

Capacities of the Southwest-Tears packaged sulfur-extraction units range up to 20 tons a day. A complete, shop-assembled unit can be shipped to any location for installation on a simple concrete foundation.

3 Reasons Why

Robbins VALVES Are the Most Economical You Can Buy

1. The only valves that can be completely serviced in less than 1 minute from the front of mounting panel without removing the valve from the line!

To service a Robbins Metering & Shut-Off Valve it is only necessary to remove the handle, loosen locknut and remove barrel assembly . . . all accomplished from the front of the panel . . . no need to disturb the line connections!

2. Single barrel assembly!

For both civilian and military installations the single barrel assembly design and construction features (barrel, spindle, spindle seals, barrel seals and seat in one unit, cleaned, lubricated, sealed for oxygen service) mean practically instantaneous renewal of service without disconnecting any plumbing.

3. As many as 5000 cycles before requiring servicing!

Many Robbins Metering Valves . . . in constant use on an 8-hour a day basis for three years . . . have never required servicing, lubrication, or any parts replaced!

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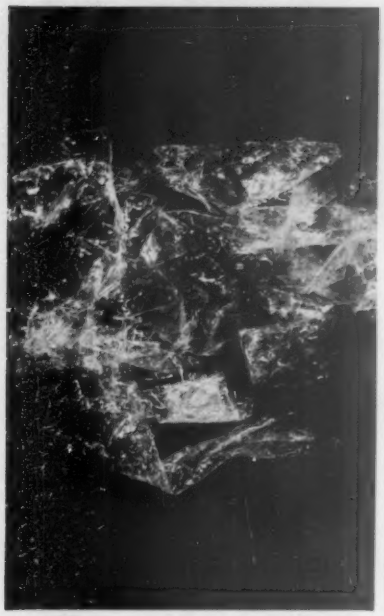

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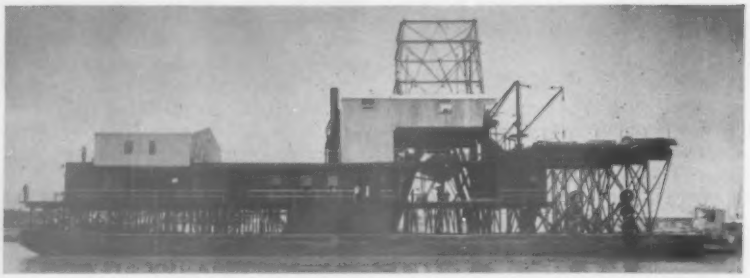

ANOTHER INSHORE DRILLING BARGE—its 89th—has been completed by American Marine Corp. of New Orleans. Slated for work with M. & M. Drilling Co., Houston, its owner, the vessel is rated for 20,000-ft. depths and can work in 18 ft. of water. The barge is shown just after its recent launching at the American ways.

New Orleans firm sets pace for inshore drilling-barge construction

A FIRM, American Marine Corp., New Orleans, who has built more than half of all inshore drilling barges, recently completed its eighty-ninth drilling barge. Since 1946, American Marine has had at least one drilling barge under construction at all times and during this period has had as many as six being built at one time.

American Marine engineers, drawing on their 15 years' experience in the field, have developed a specially designed raised-deck inshore drilling barge that is capable of drilling in water depths of 18 ft. as compared with a usual water depth of 12 ft. for a barge of this type. The new 207½ by 54 by 10-ft. drilling barge, which has been delivered to her owners, the M. & M. Drilling Co., Houston, is rated for drilling up to 20,000-ft. depths.

The barge is equipped with two 10-ton stiff-leg derricks, one port and one starboard, for handling pipe and equipment. The drilling floor is concrete and there is a 52 by 48-ft. pipe rack.

A new departure for inshore drilling barges is the automatic drilling control. This automatic drilling control and a Brewster RSH 27½ rotary are driven by the Brewster N-12 draw works which in turn is driven by electric motors. The draw works contains a 60-in. Parkersburg hydromatic brake.

For maximum control of all drilling equipment the new raised-deck barge features an all diesel-electric rig. General Motors furnished the four D-39 generators and four D-39-M electric motors. The enclosed machinery room houses all of the equipment and all engines are skin-cooled.

The barge-building firm has designed the arrangement of rig and accessory equipment with emphasis on optimum drilling efficiency. This emphasis on efficiency by American Marine is extended to the modern air-conditioned accommodations for rig personnel.

Mahogany-paneled staterooms, a spacious galley, and a recreation lounge are provided for an 11-man crew. The tool pusher has a separate stateroom with a private office.

There is a 20 by 48-ft. dry-mud-storage space on the after end of the drilling barge and an elevator is provided to handle loading of mud. The model GR-GXR and GP-GXP mud pumps and the model FK-FXK mud-mixing pump were furnished by Gardner-Denver.

The major equipment not mentioned above, and storage facilities, are as follows:

The drilling derrick is a Lee C. Moore 140-ft. mast with a 30 by 30-ft. base. The shale shaker was made by Link Belt and is a 134-53 dual. Other equipment includes a Swaco degasser and two auxiliary generators which are engine-driven 100-kw's.

Storage capacities on the drilling barge are as follows: active mud bins, 700 bbl.; reserve mud, 1,000 bbl.; fuel-oil tanks, 1,000 bbl.; water tanks, 250 bbl.; and drilling water supply, 3,500 bbl.

It is interesting to note that inshore barges in the past were usually designed for 12 ft. of water. This new model is capable of depths of 18 ft. which may point up the trend that even inshore barges are expected to work in deeper water.

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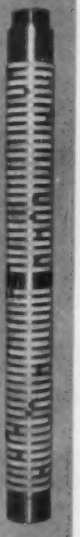

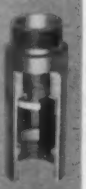

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Down Under Drilling Set

A CALIFORNIA FIRM announced that its Australian subsidiary has reached agreement with an Australian oil firm and will drill on its vast holdings in the southern portion of that country.

General Exploration Co. of California stated that Oil Development N. L. will start drilling this year on a 200-sq.-mile area to be selected out of a 4,900-sq.-mile concession held by General Exploration Co. of Australia, Ltd. This firm is owned jointly by General Exploration Co. of California and Santos, Ltd., an Australian company.

The drilling follows a recently completed exploration program.

Active Rigs*

	Rotary	Cable	Total†
Alabama	7	0	7
Alaska	7	0	7
Arizona	2	1	3
Arkansas, South	23	0	23
California, Offshore	6	0	6
Inland	85	0	85
Colo., excl. Four Corners	24	6	30
Four Corners	11	0	11
Florida	2	0	2
Georgia	3	0	3
Illinois	37	10	47
Indiana	19	26	45
Iowa	1	0	1
Kansas	77	3	80
Kentucky, western	8	41	49
Louisiana, North	95	0	95
South Inland	113	0	113
Offshore	65	0	65
Michigan	46	38	84
Mississippi	77	0	77
Missouri	0	1	1
Nebraska, East	1	0	1
West	14	0	14
New Mexico, East	78	23	101
West	43	6	49
North Dakota	15	0	15
Ohio	4	101	105
Oregon	1	0	1
Pennsylvania, North and Middle	0	57	57
South Dakota	1	0	1
Texas, Offshore	1	0	1
East	53	0	53
Upper Gulf Coast	98	0	98
North	108	0	108
Panhandle	46	6	52
Corpus Christi	118	0	118
San Antonio	43	5	48
West	203	11	214
West Central	84	21	105
Utah, South	15	0	15
Washington	1	0	1
West Virginia	6	215	221
Wyoming	57	5	62
Reported U. S. total	**1,698**	**576**	**2,274**

*Report to AAODC by the International Oil Scouts Association. †As of August 26, 1960. Not reported: Arkansas, North; California, Los Angeles Basin; Idaho; Kansas, East; Kansas, West; Louisiana, Southwest; Montana; New York; Nevada; Oklahoma; Pennsylvania, South; Tennessee; and Utah, North.

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NINE remote wildcat tests in sparsely drilled country between the Cambridge arch and the Central Nebraska basin will be drilled before March 1, 1961. Success at any of the nine will open up a new exploratory theater for western Nebraska.

Nebraska hunters eye "the other side"

BY FRANK J. GARDNER

IT'S "OVER THE HUMP" for wildcatters in southwestern Nebraska these days. Encouraged by profitable finds along the west flank of the Cambridge arch the past couple of years, and by the recent discovery of two Cambrian fields (first in the state), oil finders are going to jump the arch for a look-see at what lies on the other side.

New developments . . . So far this is barren country. But so was the Kaneb embayment until 1958. This northern lobe of the Hugoton embayment, along the Kansas-Nebraska line, was set afire by the Llanos field discovery in that year. Since then, one good field after another has been uncovered with production coming from Pennsylvanian sands at depths of 3,100 to 5,000 ft.

The play reached a climax with the Ackman field discovery last November. This Red Willow County field has emerged as one of the best in western Nebraska. The 29°-31° black oil is produced from two zones in the Lansing-Kansas City and from Oread sand at depths varying from 3,100 to 3,300 ft.

But Ackman has now been shunted into the shadows by even newer developments in Red Willow County. To the east of the field, two discoveries of oil in Cambrian sand (Reagan age) have occurred. The first was Murfin Drilling Co. 1 Barth, 25-3n-27w, a 144-bbl. pumper completed on July 5 (OJG, June 13, 1960, p. 167). Production came from Reagan sand at 3,418-25 ft. The second, still in final completion stages, is Franco-Central Oil Co. 1 Fritz, 1-2n-27w; this strike, only 1½ miles south of the Murfin well (now named Sleepy Hollow), swabbed 136½ bbl. of oil in 10½ hours on test of the Reagan sand at 3,521-24 ft.

The Sleepy Hollow discovery set off some controversy among Kaneb geologists concerning the validity of the Cambrian designation, but the Reagan age of the producing pay is now accepted by most operators in the area. The original Murfin well logged top of Reagan at 3,418 ft., top of granite wash at 3,426 ft., and top of Precambrian granite at 3,453 ft. The Franco-Central well had top of Reagan at 3,514 ft., granite wash at 3,522 ft., and granite at 3,543 ft.

May be duplicated . . . These events have cast a new light on productive possibilities along the flanks of the great Cambridge arch. Success on the west flank might well be duplicated along the eastern flank in Dawson, Gosper, and Furnas counties, and on the western flank of the Central Nebraska basin.

One independent Texas operator intends to find out. In a bold advance into virgin country, Joe Josephson, of Dallas, has announced a schedule of eight wildcat wells sprinkled through Buffalo, Dawson, Gosper, and Furnas counties (see map). On a farmout from British - American Oil Producing Co., Josephson will sink his tests in sections 3-10n-18w, 11-9n-15w, 18-12n-17w, 9-11n-18w, 10-9n-19w, 26-9n-20w, 11-4n-21w, and 14-5n-21w.

British - American itself has announced plans for a ninth wildcat in this region, the 1 McClintic, 29-1n-24w, in southwestern Furnas County. All nine tests are to be finished by March 1, 1961. Objectives presumably are Pennsylvanian and Cambrian.

A discovery at any one of these nine over-the-hump wildcats will open an entirely new province for Nebraska operations. As emphasized in this column nearly 4 years ago, "What Nebraska needs is wildcats . . . hundreds of them" (OGJ, October 8, 1956, p. 337).

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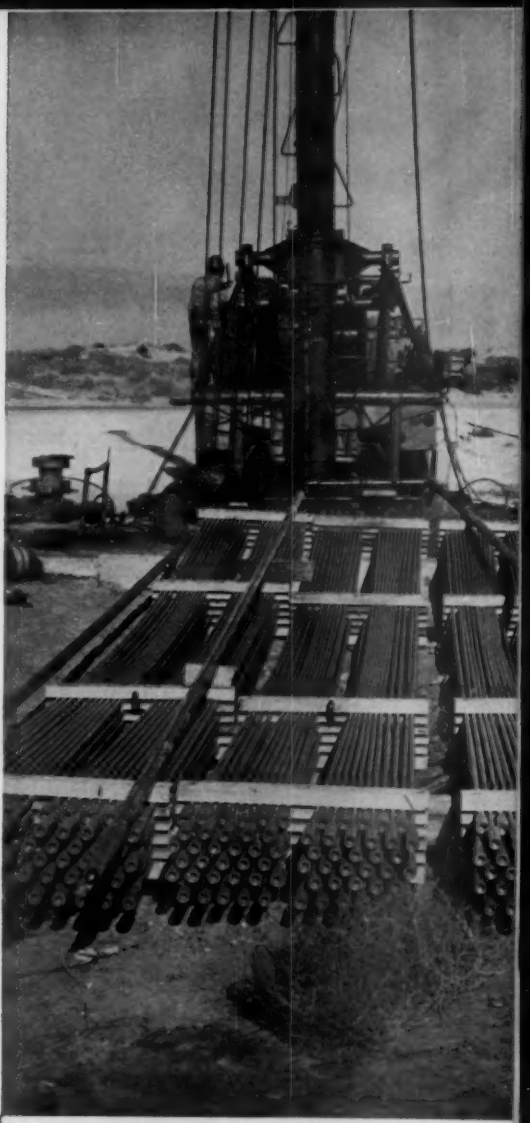

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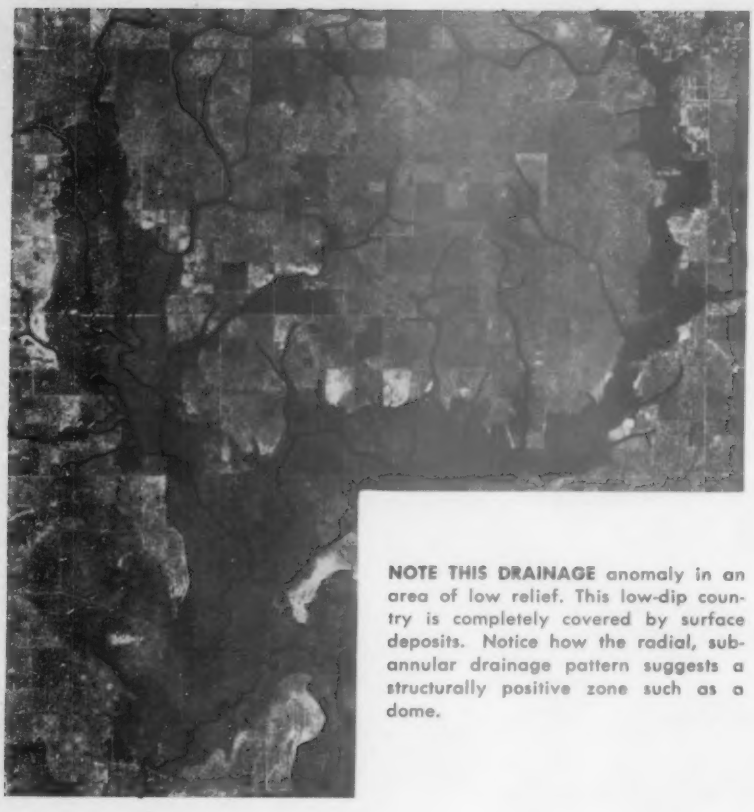


NOTE THIS DRAINAGE anomaly in an area of low relief. This low-dip country is completely covered by surface deposits. Notice how the radial, subannular drainage pattern suggests a structurally positive zone such as a dome.

Here is a dramatic review of one of the newer methods of exploration . . . aerial photography

Photogeology speeds up groundwork for oil hunters

OBSERVATIONS from the air are speeding exploration throughout the world. Aerial photos are a primary tool today in oil and mineral exploration. To the skilled interpreter, they yield an economical and intelligent picture of the geologic setting.

How such photogeologic studies advance oil-hunting can be seen in the following examples.

Radial pattern. Fig. 1 shows a flat-lying area completely masked by a veneer of recent, unconsolidated sediments. This radial, subannular drainage pattern stands out as an anomalous zone in a normally dendritic background. It strongly suggests the occurrence of a structurally positive anomaly within the section of this low-dip country.

Photo tectonics. Fig. 2 is a photo-tectonic map of the northeast portion of the Big Horn basin, Wyoming.

In areas such as this, where bedrock

About the author . . .

A. E. PRESSMAN

A. E. Pressman received his BS degree in geology from Brooklyn College, Brooklyn, New York, in 1956. While studying for his degree he was employed by the Baltimore District of the Corps of Engineers as an assistant geologist.

In 1958 Pressman became a member of the photogeology unit of Gulf Oil Corp. in New York City. He then joined Aero Service Corp. in 1959. Since joining the latter firm Pressman has been engaged in the geological interpretation of aerial photography and airborne geophysical data.

EXPLANATION
ANTICLINE, SHOWING TRACE OF AXIAL PLANE AND DIRECTION OF PLUNGE
OVERTURNED ANTICLINE, SHOWING TRACE OF AXIAL PLANE AND DIRECTION OF DIP OF LIMBS
ANTICLINAL BEND OF MONOCLINE
SYNCLINE, SHOWING TRACE OF AXIAL PLANE AND DIRECTION OF PLUNGE
OVERTURNED SYNCLINE, SHOWING TRACE OF AXIAL PLANE AND DIRECTION OF DIP OF LIMBS
SYNCLINAL BEND OF MONOCLINE
FAULT, STRATIGRAPHIC OFFSET IS VISIBLE
STRIKE AND DIP (1°–30°)
STRIKE AND DIP (31°–60°)
STRIKE AND DIP (61°–89°)
STRIKE OF VERTICAL BEDS
HORIZONTAL BEDS

THIS PHOTOTECTONIC map of the northeastern part of Wyoming's Big Horn basin, the state's oldest and biggest producer, gives a vivid picture of the rock types, strikes and dips, fault traces, structural axes, and lithologic contacts so well defined in this Rocky Mountain area. Fig. 2.

is widely exposed at the surface, it is possible to use a somewhat more direct approach in mapping the geology. In general, rock types, strikes and dips, fault traces, structural axes, and lithologic contacts will be shown on the geologic map or photo mosaic.

Where they apply, the photogrammetric plotters (such as Kelsh and Multiplex) are used to prepare controlled maps showing accurate measurements of dip angles, stratigraphic sections, and fault displacements. Moreover, this information is available quickly, secretly, and cheaply.

Aeromagnetic map. Fig. 4 is an aeromagnetic map compiled by Aero Service Corp. from USGS data of part of the Big Horn basin.

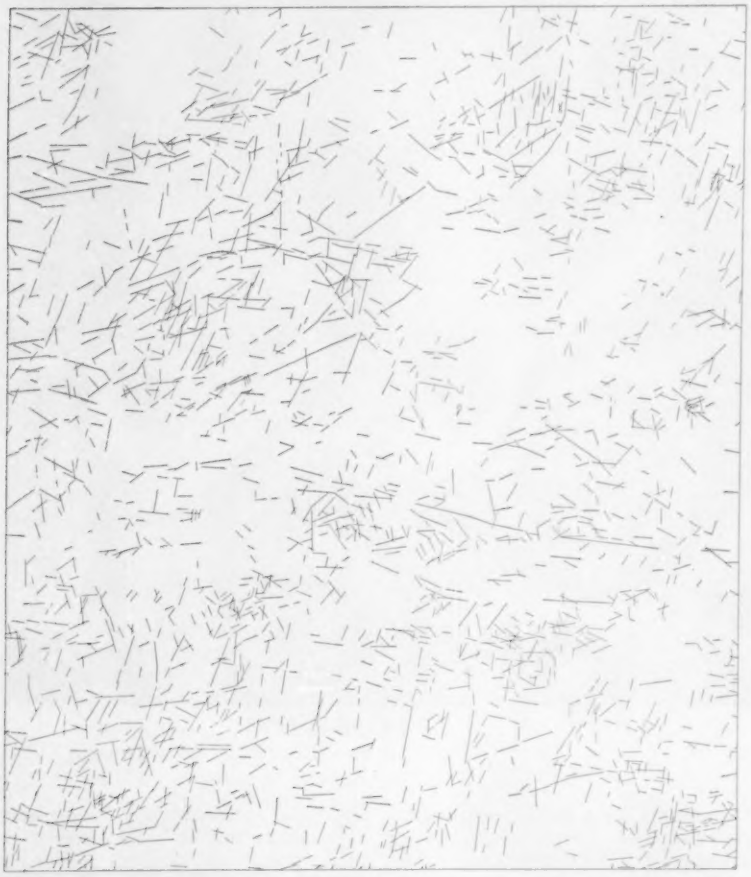
Its area covers the same areas as the phototectonic map. A quick check of these reconnaissance geophysical data shows that in general the magnetic trends are oriented northwest. This agrees with the structural "grain" seen at the surface and with the outline of the basin itself. It suggests that both the basement surface and the sedimentary section were subject to similar tectonic forces in a northeast-southwest direction. Both have suffered the effects of these forces.

Editor's Note:

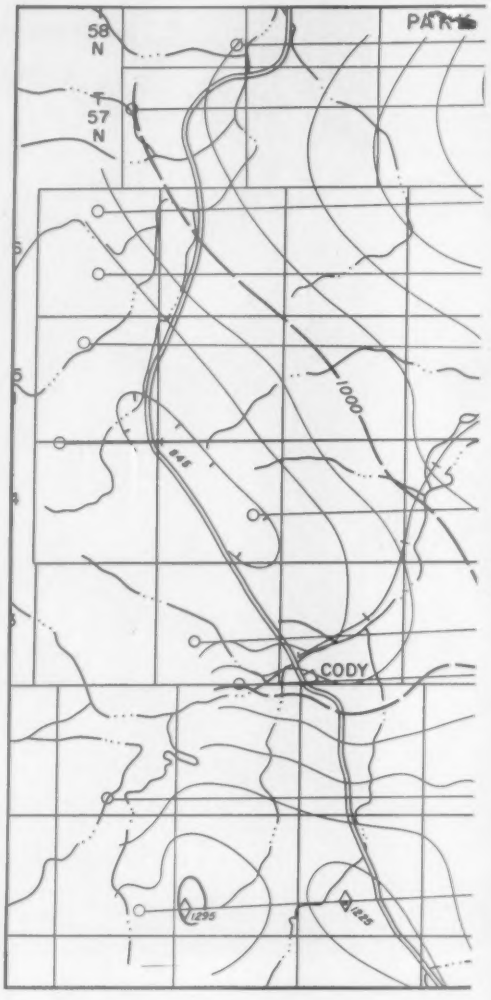
For many years, the geologist tramped across the surface of the earth, slowly and painstakingly mapping its topographic and structural expression. Today, he finds it quicker, easier, and cheaper to look at that same surface from the air, photograph it, and interpret it in the comfort and convenience of his office. Surveys that may have required months now can be made in days. Projects that cost thousands of dollars in time and logistics now can be measured in fractions of the earlier expense.

Photogeology, photogrammetry, structural geology, geophysical surveys—all can be combined in a survey such as these illustrations portray. By studying aerial photographs, the interpreter can construct maps depicting surface geology, magnetic subsurface expression, formation thicknesses, and regional tectonics.

Nothing, of course, will ever replace the accurate work of the field geologist as he probes, cuts, measures, feels, and tastes the surface rocks of the earth. But the aerial photograph can speed his task, guide him to unsuspected short cuts, and reveal to him those subtle changes in nature's visage that may influence his final interpretation.



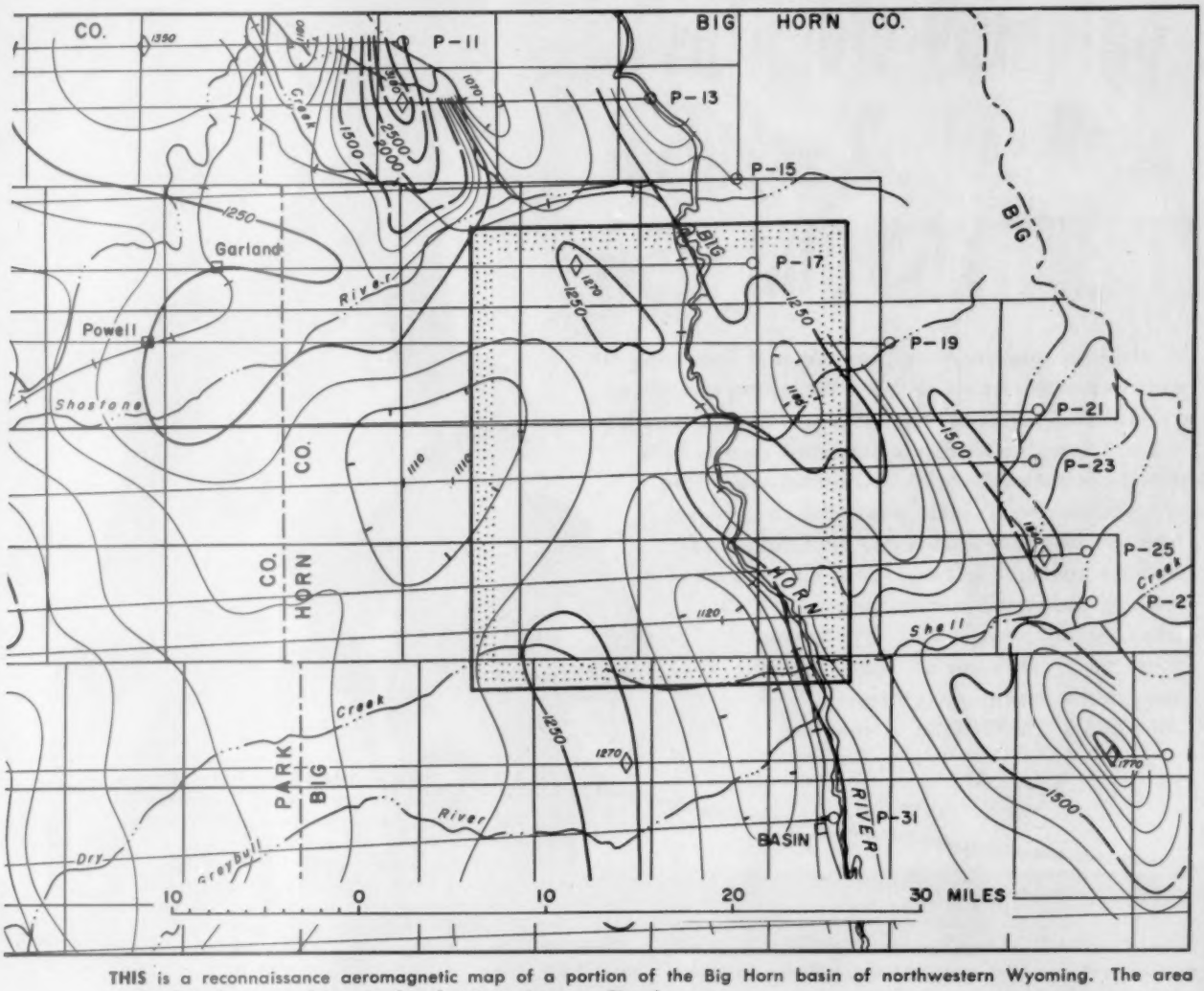
TO PREPARE THIS FRACTURE MAP of the West Red Lake area of Canada, the aerophotogeologist systematically delineated all fractures discernible on the aerial photograph. Utmost care was taken to disregard all nonfracture-caused features such as those due to glacial activity, bedding traces, etc. By measuring azimuth and concentration, these fractures can now be statistically analyzed to locate anomalous fracture zones of geological significance. Scale: 1 in. equals 5 miles. Fig. 3.



Depth-to-basement findings, based on the geophysical data, reveal a general northeast thinning of the section toward the Precambrian exposures which form the basin rim. Surface effects of deep-seated anomalous conditions (as shown by the magnetic surveys) are sought on the photos to see if the overlying section has been disturbed. In this integration of aeromagnetics and photogeology the two tools support and supplement each other to provide more complete, intelligent geological dope.

Structure contour map. Fig. 5 is a photogrammetrically-compiled structure contour map on top of the Wingate sandstone in the Kaiparowitz region, Utah.

To prepare this, the photogeologist picks points on the top of a key formation or almost any recognizable geologic horizon. In this case, the Wingate was used. Elevations were then measured at these points with a Kelsh plotter. (Note: using diapositives



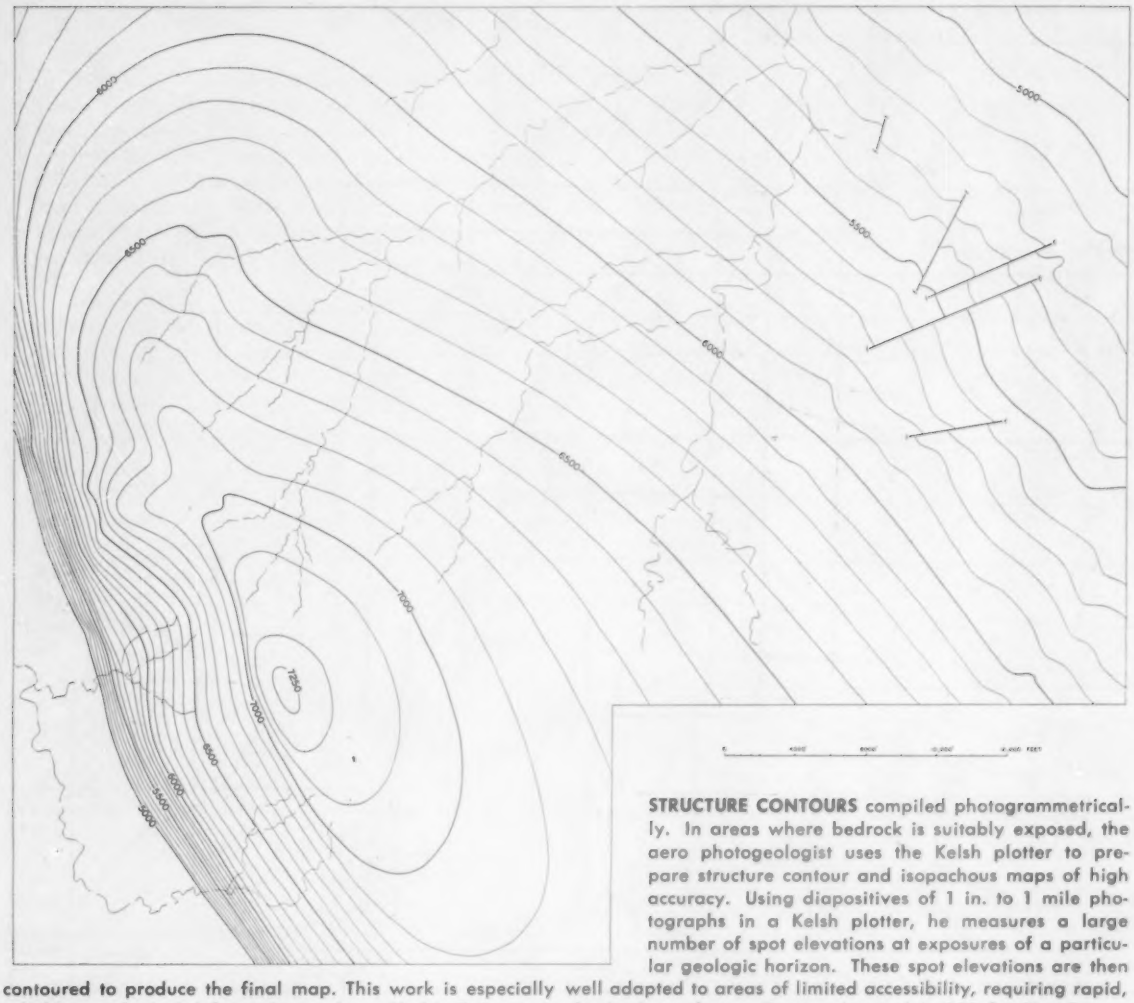
THIS is a reconnaissance aeromagnetic map of a portion of the Big Horn basin of northwestern Wyoming. The area outlined is the same shown in the phototectonic map. Fig. 4.

of this 1:60,000 photography, spot elevations are accurate to 6 ft. Larger scales yield greater accuracy.) These elevations were then contoured to form the structure map. Necessary control can be taken from topographic maps, or, if this is not available, an arbitrary datum can be chosen provided photographic tilt is kept to a minimum. This work has the advantages of rapidity and accuracy as large numbers of spot elevations are readily recorded.

Isopachous map. Fig. 6 is a photogrammetrically-compiled isopachous map of the combined Wingate and Chinle formations. It covers the same structure as Fig. 5. Points were picked on the top of the Shinarump (directly underlying the Chinle), and their elevations were measured. These were accurately plotted on the Wingate structure map (Fig. 5). The differences in elevation were marked, i.e., the thicknesses of the Wingate and Chinle combined, and then contoured to produce this isopachous map.

Fracture map. Fig. 3 is a photogeologic fracture map of the West Red Lake area of the Canadian shield. It shows joints, groups of joints, and/or faults. In its preparation, the photogeologist carefully traced all fractures seen on the aerial photo. Utmost care was taken to exclude lineations due to glacial activity, regional strike, man-made features, and other nonfracture lineations. Plotting of the fractures was confined to: straight stream segments, straight lake boundaries, lineations in the soil and/or plant cover, jointing and faulting in the bare bedrock, and geomorphic features such as trenches and gaps. Only the most dependable information was used. Usually, at least two of these criteria were observed before a fracture was plotted. For instance, a straight stream segment might be mapped as a fracture if it were perfectly aligned with a lineation in the adjacent vegetation

"Surface effects of deep-seated anomalous conditions are sought on the photos to see if the overlying section has been disturbed. In this integration of aeromagnetics and photogeology the two tools support and supplement each other to provide more complete, intelligent geological dope."



STRUCTURE CONTOURS compiled photogrammetrically. In areas where bedrock is suitably exposed, the aero photogeologist uses the Kelsh plotter to prepare structure contour and isopachous maps of high accuracy. Using diapositives of 1 in. to 1 mile photographs in a Kelsh plotter, he measures a large number of spot elevations at exposures of a particular geologic horizon. These spot elevations are then contoured to produce the final map. This work is especially well adapted to areas of limited accessibility, requiring rapid, reliable, geological information such as Utah's Kaiparowits basin, here shown. Contour interval is 100 ft. Fig. 5.

or soil, or perhaps with a nearby straight lake boundary or with another straight stream segment.

Using number of fractures and fracture azimuth as variables, a statistical analysis of this West Red Lake population will be carried out. All correlation between the two types of data will be sought in an effort to reach a more complete understanding of the geological relationships.

Besides its usefulness in the exploration phase, this rapid method of mapping fractures on aerial photos has also helped the engineer in the layout and design of the mines.

Limitations. Certainly the photogeologist is limited in his interpretation to what can be seen in a stereoscopic view of the earth. However, a review of pertinent literature aids our conclusions as to structure and lithology, which are mostly based on thorough study of the discernible surface indicators.

In many cases, the stereophoto view is next best to field work. In fact, the aerial view from 20,000 ft. may reveal surface expression of buried structures not apparent to the field geologist. Subtle tonal changes of soil or vegetation, anomalous drainage patterns, or abrupt changes in the density of drainage network may show up on the aerial photo. Also, fracture lineaments reveal themselves on the photos. They are seen as narrow bands of tonal change in the soil or vegetation and as aligned geomorphic features, such as water gaps, trenches, and scarps. These lineaments can help

"Fracture lineaments reveal themselves on photos as narrow bands of tonal change in the soil or vegetation and as aligned geomorphic features such as water gaps, trenches, and scarps."

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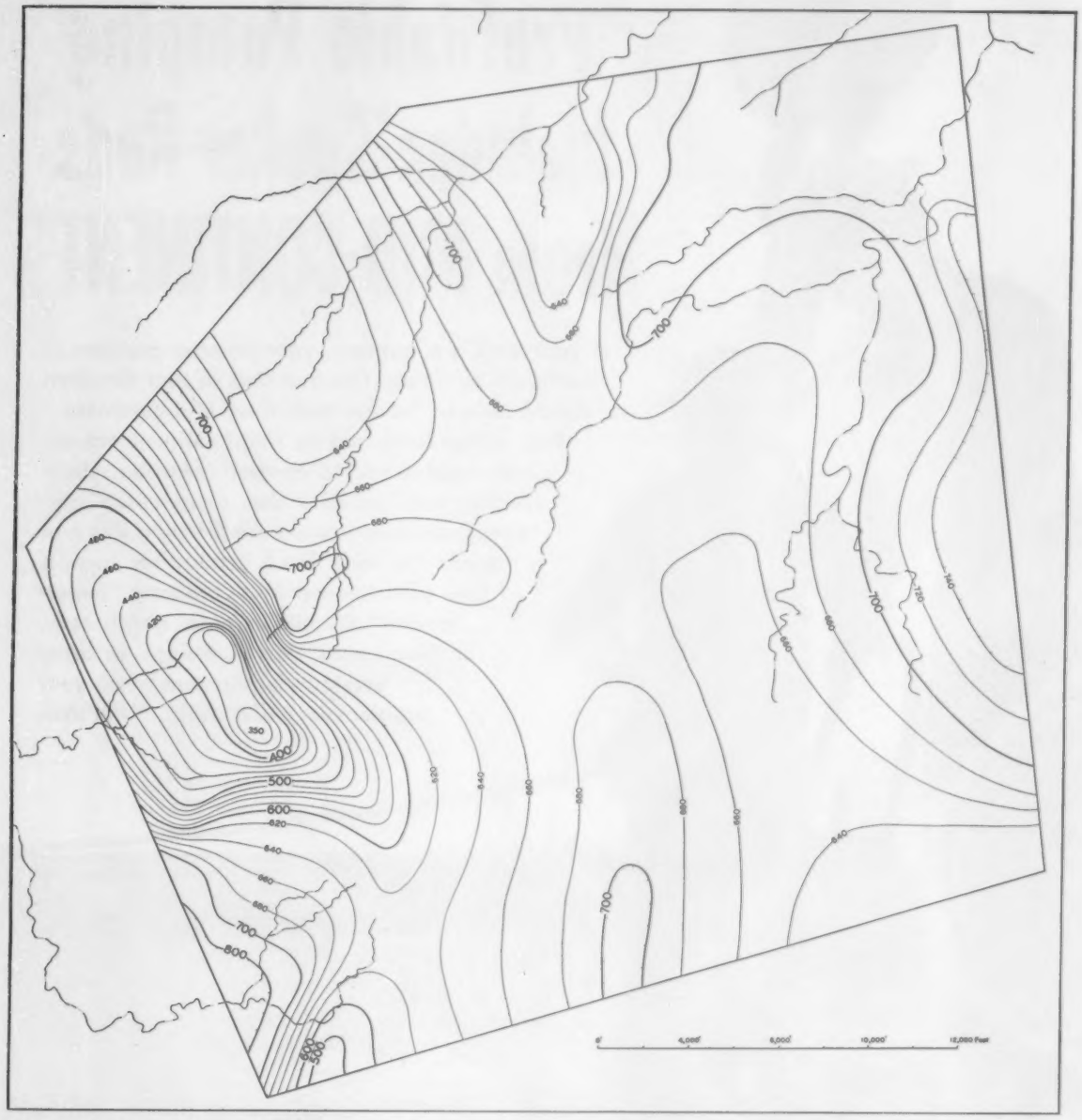
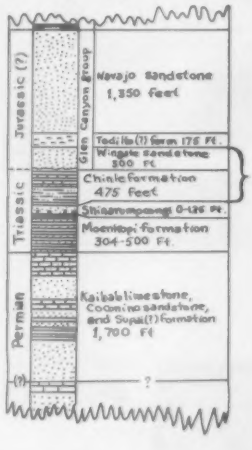


THIS ISOPACHOUS MAP is of the Wingate and Chinle formations in the Kaiparowits basin of Utah combined. Using a Kelsh plotter, an aerophotogeologist measured spot elevations at the lower contact of the Chinle formation. These elevations were then accurately plotted on the structure contour map drawn on the top of the Wingate sandstone. Differences in elevation, i.e., thicknesses of the Wingate and Chinle formations combined, were determined and isopachous lines drawn. These thicknesses were measured at 62 points. Contour interval is 20 ft. Fig. 6.



extend known faulting, and perhaps may indicate deep-seated faults whose surface expression is a zone of fracture which does not show lithologic offset.

Bibliography

1. Blanchet, P. H., "Development of Fracture Analysis as Exploration Method": Bull. AAPG, Vol. 41, pp. 1748-59, 1957.
2. Kaiser, E. P., "Structural Significance of Lineaments (Abs.)": Bull. Geol. Soc. Am., Vol. 61, No. 12, Pt. 2, pp. 1475-76, 1950.
3. Lattman, L. H., and Nickelsen, R. P., "Photogeologic Fracture-Trace Mapping in Appalachian Plateau": Bull. AAPG, Vol. 42, pp. 2238-45, 1958.
4. Mayo, E. B., "Lineament Tectonics and Some Ore Districts of the Southwest": Trans. AIME, Vol. 211, 1958.
5. Mollard, J. D., "Study of Aerial Mosaics in Southern Saskatchewan and Manitoba": Oil in Canada, August 1957.
6. Moody, J. D., and Hill, M. J., "Wrench Fault Tectonics": Bull. Geol. Soc. Am., Vol. 67, pp. 1207-46, 1956.

Already-drilled Canada area yields gas

A PAIR OF TESTS in previously well-drilled regions of western Canada have indicated gas success. One of the ventures lies in the southeastern sector of Alberta, very near the Canadian-U. S. border while the other is in the general Hoosier district of southwestern Saskatchewan, a few miles east of the Alberta-Saskatchewan boundary.

Alberta. The more important of the two appears to be the southeastern Alberta strike. Drilled by the team of Home Oil Co., Ltd., and Pacific Petroleums, Ltd., commercial showings of gas were found in three separate zones. The other was a dual-zone discovery, and was drilled by the group of Altair Oil & Gas, Ltd., and two American independents, Harrington and Marsh.

The Home Oil - operated strike, Home-Pacific 16-29-1-11 Knappen, on LSD 16, 29-1-11w4, is 4¾ miles north of the International boundary, 75 miles southeast of Lethbridge and 180 miles southeast of Calgary.

It found natural gas in the Basal Cretaceous, Sawtooth (Jurassic) and Mississippian horizons. The Basal Cretaceous flowed 3,749 M.c.f.d., the Sawtooth rated 2,100 M.c.f.d., the Mississippian rated 4,500 M.c.f.d. Drill-stem test in the Basal Cretaceous was run over a 10-ft. interval below 2,610 ft.; while the Sawtooth was evaluated over a 40-ft. interval and the Mississippian was evaluated three times in a 58-ft. section. The Sawtooth came in about the 2,620-ft. level and the Mississippian below 2,690 ft.

Saskatchewan. The other strike, Altair - Harrington - Marsh 6-3-32-27 Antelope, was drilled on LSD 6, 3-32-27w3, 10 miles east of the Alberta-Saskatchewan boundary. It uncovered gas in both the Viking and Banff horizons. The Viking flowed at rate of 2,300 M.c.f.d. during drill-stem test operations and the Banff has been production-tested for rates up to 5,470 M.c.f.d.

Most significant part of the latter find was the occurrence of gas in the Banff. The well is the first such commercial find in the area as the Banff sand is better known in this part of the province as a heavy-gravity oil producer.

The Home strike in Alberta is in itself a very interesting test as it will be carried on down to test the Precambrian at a depth of about 5,900 ft. It will be the first well within 30 miles to evaluate those lower horizons. In fact it has only been within the last 6 months that "deep drilling" in the southeastern sector of Alberta has been really instituted.

Home had previously drilled another deep test in the Taber region as had Honolulu Oil Corp. and word has it that fairly sizable programs are being considered by Home and others in the district. Beforehand most of the wells have tested to depths not much in excess of 3,500 ft.

Home drilled the Knappen strike on lands acquired under farmout agreement from Pacific Petroleums, Ltd. For drilling the well, Home-Alminex, Ltd., & Kern County Land Co. will earn a half interest in 18,000 acres of petroleum and natural-gas rights.

The Altair-operated hole, meanwhile, lies on Saskatchewan Government Permit No. 1156. That tract, which lies just north and east of the Hoosier Viking Chert pool, was purchased by Altair for a cash consideration of $39,025.

New oil strike for Saskatchewan

Saskatchewan got a new oil strike just north of Steelman field.

The new well is the Mississippian formation 23 miles north of the Steelman field in southeastern Saskatchewan.

The discovery was made by Placid Oil Co.

The well drilled in the Kisby-Forget region, yielded 400 ft. of oil during one test. Production casing was set to further evaluate the horizon.

The strike, Placid Tidewater 9-10 Gapview, is on acreage acquired under the agreement with Tidewater Oil Co. It is located ½ mile northeast of abandoned Tidewater 3-10 East Warmley Crown well. This well had earlier shown only a small oil shoal in the Mississippian formation. The Placid well was drilled to a depth of 4,170 ft. and production casing set was to 4,070 ft. Production equipment is now being installed and the output promises to be good.

The Placid well is a new discovery as distinct from development wells in Steelman field. It is giving encouragement to Saskatchewan oil men to review development areas and look further afield.

Oklahoma gets big gas-distillate find

A major gas distillate discovery in the Bromide sand is indicated in the Cleary Petroleum, Inc. et al., 1 Hilltop located NE SW 16-8n-5w, Grady County, Oklahoma, approximately 30 miles southwest of Oklahoma City.

Massive Bromide sand zone was encountered at 11,700 ft. and approximately 45 ft. of pay sand were cut and cored. A 35-minute drill-stem test of the interval from 11,708-71 had gas calculated at 31 M.c.f.d. with a recovery of approximately 10 bbl. of distillate. Drilling fluid reversed out was heavily cut with gas and distillate.

Bottom-hole pressure rose from 5,180 to 5,240 psi. during the test. Shut - in bottom - hole - pressure test failed. Shut-in top-hole pressure was 3,100 psi. in 35 minutes. The entire Bromide section was cored. Pay zone had some permeability in excess of 500 md. and porosities as high as 19.2%. Average porosity was 11.9%.

Straddle test of zone 11,776 to 11,814 had gas to surface in 2 hours and recovered 3,150 ft. of slightly distillate and gas-cut water cushion. Pressure and core information indicated zone was heavily mud-invaded and operator considers this test inconclusive.

Seven-inch casing will be set at approximately 12,100 ft. and company intends to deepen the hole to test three other Ordivician horizons. Osborne sand at 10,050 and Hunton lime at 10,700 ft. appear to have production possibilities that have not been fully evaluated.

Remote test. There is Ordivician gas production approximately 30 miles north in Township 12 North, 5 West and approximately 30 miles south in the complex Chitwood, Carter-Knox area. The Hilltop well is believed to be of major significance because it is the first Ordivician test in the area that has had excellent quality sand as indicated by cores and drill-stem test flow rates. The well has touched off widespread lease and royalty plays. In Grady County alone, there is no Ordivician production north of Township 5 North. An area of approximately 500 sq. miles in Grady County, Townships 7 North through 10 North, has had only five Ordivician tests including the Hilltop.

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SE New Mexico leads Permian play

SOUTHEASTERN New Mexico exploration continues to lead in the vast Permian basin region. Pennsylvanian, Permian, and Devonian discoveries feature current developments.

Union Oil Co. of California 2-27 Crawford, an old well reentered in NW SE 27-24s-26e, Eddy County, flowed 7,200 M.c.f.d. from Morrow Pennsylvanian to open a new producing area.

In Eddy County, Texas Pacific Coal & Oil Co. 1 USA Woolley, SW SW 21-17s-30e, flowed 54 bbl. of oil per hour from Abo.

Major Devonian discovery for Chaves County is Texaco 1 Kinahan-Federal in SW SE 20-15s-30e. The well flowed 800 bbl. of oil during a 5-hour test from deep Devonian perforations at 11,044-71 ft. Flow was through ½-in. choke. Location is ½ mile north of Little Lucky Lake field, 15 miles northwest of Maljamar.

A northwest extension success to West Crossroads field in Lea County is Pure Oil Co. 2-D Federal in NW SE 31-9s-36e. The well flowed 635 bbl. of 43.5°-gravity oil per day from Devonian perforations at 12,001-37 ft. through 14/64-in. choke. Location is 12 miles southeast of Milnesand.

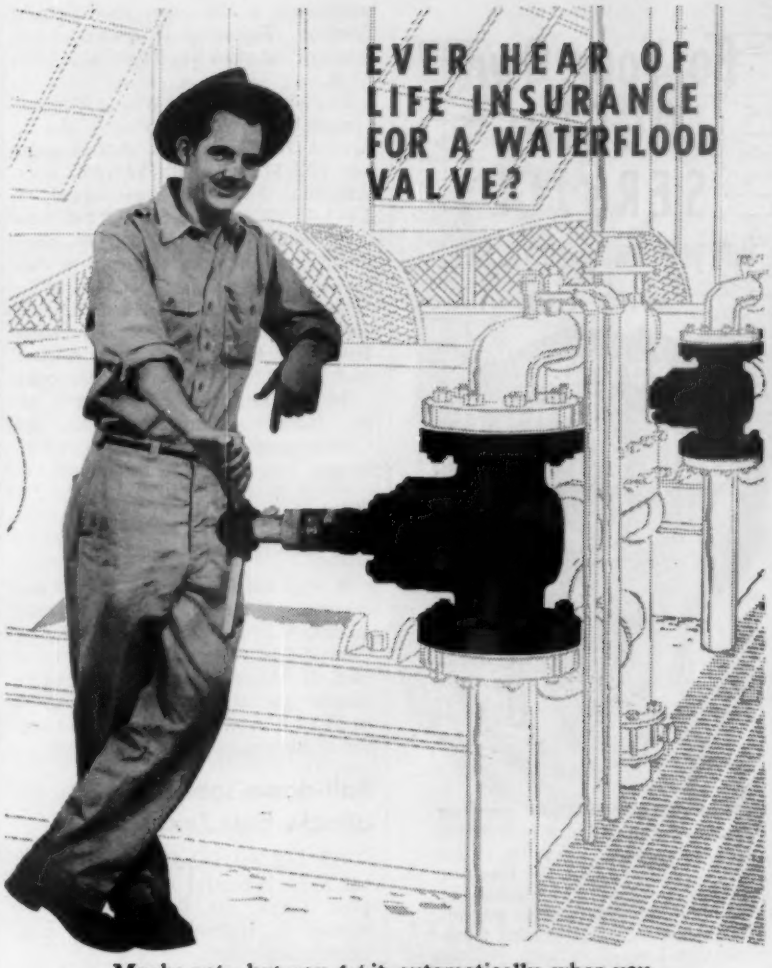
Cabeen Exploration Co. completed 1-K State in northwestern Lea County flowing 364 bbl. of oil per day from Wolfcamp at 8,354-8,771 ft. Location is in NE SW 11-10s-32e. It is northeast of Mescalero field. This is the second big Wolfcamp discovery in Lea County recently. Union completed 1-33 State in SW NW 33-15s-32e for 1,224 bbl. per day from Wolfcamp.

In the Abo Reef trend Sunray Mid-Continent Oil Co. completed two good wells. The V-2 New Mexico in NW NW 35-17s-28e flowed 880 bbl. daily on 14/64-in. choke from perforations at 6,283-6,313 ft. in Abo; the V-1 New Mexico in SW NW 35-17s-28e flowed 496 bbl. per day from perforations at 6,266-94 ft.

Ohio tests hit Newburg pay

In Ohio, commercial production in the Newburg horizon was found in tests scheduled to be drilled to the Clinton sand, one in Richland Township, Holmes County and another in Plain Township, Wayne County.

Oil Well Drilling Co. 1 Charles Crider, Section 23, Richland Township, Holmes County, had a natural gage of 298 M.c.f.d. with a rock pressure of 1,050 psi. Nearest Newburg



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production is 2½ miles southeast in Tiverton Township, Coshocton County. The sand was logged at 2,750-73 ft.

In Plain Township, Wayne County, Lincoln Oil Well Service 1 J. B. Arnold Jr., Section 8, shut-in gage was 103 M.c.f.d. with 825 psi. after acidation. The sand was logged at 2,843-48 ft. and had 95 M.c.f.d. natural. Some Newburg gas has been found about 4 miles southeast in this township.

Kent Kane & Co. finalled the best well completed this year in Monroe Township, Ashtabula County. A flow of 5,250 M.c.f.d. was reported for the 1 Martin Ojajari, Lot 12, only ¼ mile from the Pennsylvania line. The Clinton sand was logged at 3,189-92 ft. and had 304 M.c.f.d. natural.

Alberta's Col Lake hits commercial gas

Ranger Oil (Canada), Ltd., has discovered natural gas in commercial quantities in the Col Lake district of Central East Alberta, 145 miles northeast of Edmonton. The new strike flowed gas at rate in excess of 1 M.M.c.f.d. from the Colony sand sector of Blairmore in drill-stem tests.

Salt-dome specialist attacks East Texas domes

Oil and gas secrets of the Keechi salt dome in central Anderson County, East Texas, are to be probed by Michel T. Halbouty, Houston independent operator.

Keechi, 4 miles north of Palestine, is one of the many remaining so-far unproductive "inland" domes of the East Texas embayment.

Halbouty, who long has been a student of and worked with Gulf Coast salt domes, has location at Keechi for 1 B. H. Gardner in the Peter Hinds Survey, on the flank of the dome. A 6,000-ft. test is planned with Woodbine sand as the objective.

Second offset slated for Texas discovery

ANOTHER ATTEMPT is being made by Shell Oil Co. to confirm the discovery it made last March of Jurassic production in the Bryans Mill area of northern Cass County.

It is starting a west offset to its discovery well, 1 V. B. Allsup, completed with an open-flow potential of 22 M.M.c.f. of condensate-laden gas daily from the Smackover zone, perforated at 10,297-10,367 ft. Condensate recovery was placed at 233 bbl. per million cubic feet.

The new test is 1 William Blair

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with location in the B. F. Lynn Sur. It is 2,630 ft. from the discovery well.

Since completion of the discovery well, Shell has drilled three dry holes in the area. All were long stepouts. one was ¾ mile west of Bryans Mill, another a mile northwest, and the third 2 miles northwest.

Pecos County has new Wolfcamp gas discovery

Far West Texas' Pecos County had new Wolfcamp Permian gas production. The discovery well is Champlin Oil & Refining Co. 1 Cities Service et al., 5 miles northwest of Bakersfield.

The well was completed for a calculated open-flow potential of 6,400 M.c.f.d. Production is from perforations at 4,666-4,724 ft. Location is in Section 123, Block 11, H&GN Survey.

Michigan well is reef-gas prospect

In Michigan, Panhandle Eastern Pipe Line Co. 1 Holmes, SE SW SW 32-4n-14e, Lenox Township, Macomb County, gaged 410 M.c.f. gas natural in A-1 Salina at 2,750 ft. for a new reef prospect in southeastern Michigan.

The test was carried into Niagaran where production tests at 2,839 ft. are in progress in tight formation.

● The sixth consecutive wildcat failure from 5 to 15 miles northwest of established oil production on the Scipio - Albion trend was reported. Athens and Ryan 1 Hickok NW NW NW 30-1n-5w, Eaton County, bottomed out at 5,025 ft. after drilling limestone section from Trenton top at 4,401. More wildcats on the trend are projected.

● Revival of drilling in the 15 months old McBain pool, Missaukee County, best basin development in the past 3 years, is predicted following completion of good producer on the extreme northeast end of the 1,000-acre pool. Sylvania Development 1 Frick, NE SW NE 20-21n-7w, flowed 13 bbl. oil per hour on 14/64-in. choke through casing at 4,003 ft. Well is on a Pure Oil Co. 120-acre lease farmout.

Oklahoma's McAlester basin has discovery

The extreme southwestern corner of the McAlester basin has its first important discovery in some time at Tennessee Gas Transmission Co. 1 Hargrove Hudson in C NE NW 7-1n-10e, 5 miles northeast of prolific East Oconee field, Oklahoma.

The well is undergoing production tests. A drill-stem test in the upper McLish Ordovician sand at 7,899-7,924 ft. got 120 ft. of gas-cut mud. A test at 8,114-33 ft. got 35 bbl. of oil per hour on 5/8-in. top and bottom-hole chokes. Recovery was 7,300 ft. of oil and now water. A test at 8,373-93 ft. got 5,783 M.c.f.d. with recovery of 1,095 ft. of heavily gas-cut salt water. Perforations at 8,367-69 ft. got 2,600 M.c.f.d.

Flowing oil well finaled in Kansas' Stafford County

Mississippian oil production is reported at a flowing discovery in Stafford County, Central Kansas. The discovery well is Tomlinson-Kathol 1 Smith in SE SE NW 23-25s-15w.

Initial potential was 86 bbl. of oil daily from perforations at 4,263-79 ft. The well opens East Smith pool.

Rooks County. Other Central Kansas uplift activity includes a new pumping discovery in Rooks County. Imperial Oil Co. of Kansas, Inc., 1 LeSage, SE SE NE 18-7s-20w, 4 miles northeast of Nicodemus and 4½ miles west of now-dry Alcona Arbuckle field, pumped 241 bbl. of 36°-gravity oil daily from Lansing Pennsylvanian

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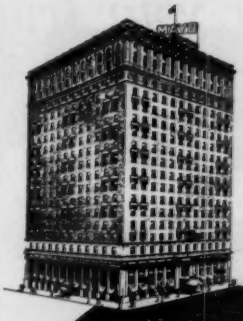

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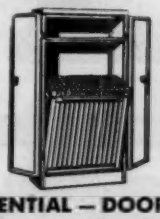

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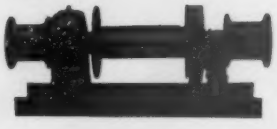
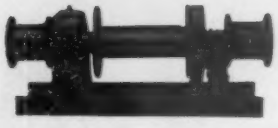
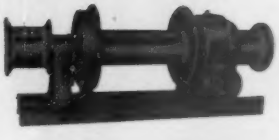


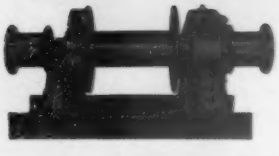
MS6 SERIES Rugged models rated at 15,000 pounds capacity. Equipped with Braden's special Oil Cooled, Fully Adjustable Automatic Safety Brake.



MS9 SERIES These models, rated at 20,000 pounds, are among the most popular winches in America. They are designed for low speeds, so are ideal for heavy handling jobs that require perfect load control.



MS12 SERIES The smallest of the Braden heavy duty models with a 30,000 pound capacity. They are especially adaptable for commercial elevator hoists and heavy duty trucking.



MS18 SERIES Very similar to the MS12 models except capacity is 45,000 pounds. The Braden Oil Cooled, Fully Adjustable Automatic Safety Brake is standard equipment on this series.

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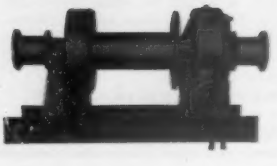

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perforations at 3,348-50 and 3,390-92 ft. The discovery opens LeSage pool.

Seward County. In Southwest Kansas, Anadarko Production Co. completed the discovery well of Arkalon field, Seward County.

The 1-36 Davies, NE SW NW 36-33s-32w, flowed 3,500 M.c.f.d. from perforations at 5,752-69 ft. in Mississippian.

Lisbon gap slated for test in Utah

Pure Oil Co. will try for the middle on the Lisbon Valley anticline at 1 Island Mesa, C NW SW 22-30s-26e, San Juan County, Utah.

This 11,500-ft. Devonian test will try for production between Lisbon field on the northwest and Southeast Lisbon across the line to the southeast in San Miguel County, Colorado. Location is 8 miles east of Pubco Petroleum Co. 2-20 Lisbon-Federal in C NE NW 20-30s-25e, closest Lisbon location. The Island Mesa wildcat is 4 miles northwest of Pure recently announced 4 Southeast Lisbon northwest extension try in C SW NW 31-45n-19w, San Miguel County.

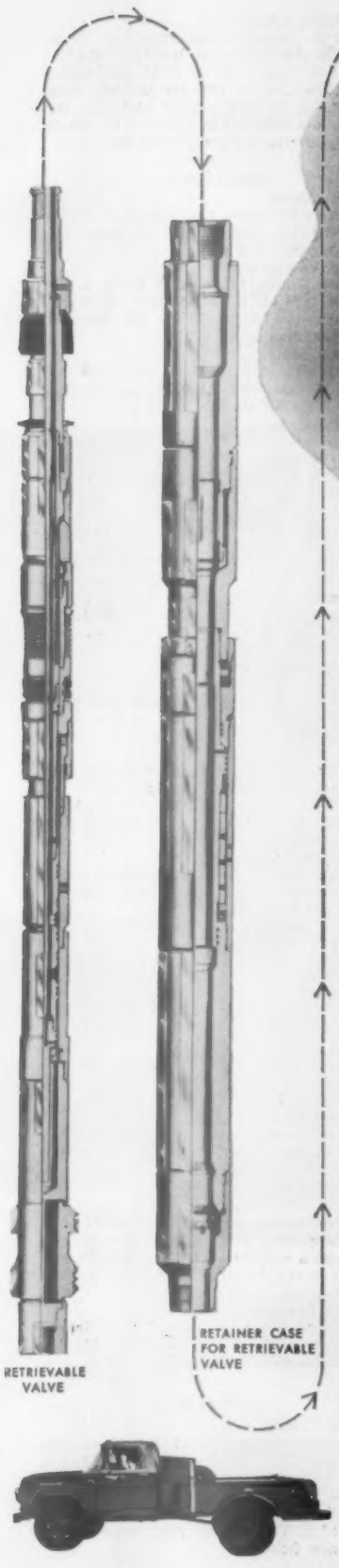
Extension set for Wyoming's Green River

The first extension to a recent southwestern Green River discovery in Uinta County, Wyoming, will drill to 13,000 ft. or Cloverly. It is Sohio Petroleum Co. 1 UPRR in C SE NW 13-15n-113w. The well is the extension try to Max Pray 1 Government-Akridge in C Lot 5, 19-15n-112w. Pray's discovery, ¾ mile southeast, flowed up to 20 M.M.c.f.d. from Dakota perforations during drill-stem tests at 12,878-12,964 ft.

Another well was announced last week for this part of Green River. Pure Oil Co. will drill to 13,800 ft. and Dakota at 1 Butcher Knife Springs unit in NE SW 21-14n-113w. Pray's discovery lies 4 miles south of Church Buttes field and was the first strike in some time for this area of Wyoming.

Texas reentry is new Esperanza field producer

A Lavaca County old well worked over project resulted in a producer. This new well is Miller & Fox Minerals Corp. 2 Fitzhenry unit. It flowed 9 M.M.c.f.d. plus 18½ bbl. condensate per million from Wilcox pay at 7,846-52 ft. This is the third well for the field 11 miles southeast of Yoakum. The operators have two other



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The Retrievable Valve Tester is composed of two basic assemblies — The Retrievable Valve, for opening and closing positions for formation testing — The Retainer Case, to provide a seat for the Retrievable Valve.

Retainer Case is run in tubing above "RTTS" Packer and is an integral part of tubing string during all operations. Valve is operated by right hand tubing rotation when set in Retainer Case. Setting blocks lock the Valve in the Case preventing Valve from being forced up tubing from pressure below. Valve is released from Case by a 5-position sliding valve which is set in close position; and is removed by wire line or reversed circulation after test; leaving full opening through tubing string.

A pressure recorder attached to Valve and locked in place in Retainer Case before going in hole offers many operational benefits:

- Formation testing with complete closed-in-pressure
- Allows removal of Valve and pressure recording device to check bottom hole pressure ... without unseating packer
- Permits a continuous flow test
- Application of stimulation treatment
- Downhole operations can be repeated on multiple zones ... *with only one trip into hole*

RUNNING CASE WITH STRAINER FOR PRESSURE RECORDING GAUGE...

Serves as a protective case for running Pressure Recording Gauge with Retrievable Valve Tester. Attached to lower end of Valve, permits removal of Gauge with Valve for examination of pressure chart recordings immediately after test is completed.

For *better* well services—*routine or special*—Halliburton provides "SPECIAL TOOLS FOR SPECIAL JOBS"... call your local or district Halliburton Representative today for Special Tool Services whenever or wherever the need occurs.

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wells in Esperanza field. The 1 Williams in I. G. Gregory Survey, A-701, and the 2 R. A. Williams in S. Thompson Survey, A-555. The new well is in William John Survey, A-262.

Goliad County. The northernmost well at Poehler field in Goliad County flowed 1,460 M.c.f.d. and condensate from the 8,300-ft. Massive Wilcox sand at 8,278-84 ft. The well is Rehler-Carlson 1 Oscar H. Oehlke, 7 miles southwest of Weesatche in James Cunningham Survey, A-84.

New gas discovery finaled in Texas Panhandle area

Ochiltree County in the Texas Panhandle has a new gas disscovery at Shamrock Oil & Gas Corp. 1 W. L. Herndon, Jr., et al. "A." The well flowed 13 M.M.c.f.d. from lower Morrow Pennsylvanian at 8,744-86 ft. The Cleveland sand flowed 4,972 M.c.f.d. during tests.

Red Cave. Permian Red Cave production was opened at H. N. Burnett R-1 Poling in Carson County, Section 22, Block Y-2, AB&M Survey, 4 miles south of Fritch.

The well flowed 1,500 M.c.f.d. from 1,650-1,739 ft. This is the first of three Red Cave tests for this Amarillo operator.

Delaware sand oil pool opens in West Texas area

Reeves County in West Texas has new Delaware sand production. Discovery well is Texas Crude Oil Co. 1-24 Anna Slack, 13 miles east of Pecos in Section 24, Block 6, H&GN Survey.

The well was completed flowing 125 bbl. of oil plus 13% water through 24/64-in. choke from perforations in the Delaware sand at 4,932-39 ft. Nearest Delaware sand production is 6½ miles northwest with intervening dry holes. Nearest production is at Worsham 1,850 ft. southeast.

The new field will be called Worsham Delaware field.

Discovery wells

ARKANSAS

Calhoun County:
Bollenbacher & Kelton 1 Calion, C NE SE NW 1-16s-14w, 3⅜ miles northeast of Calion. IPP 81 BOPD (net), 20% water, 28.8°, perf. 3,040-43 ft., Travis Peak. TD 3,205 ft. New pay and extension Cross Country Slough field. (Oil well formerly dry at 2,642 ft.)

Miller County:
A. T. Farr, Jr., 2 Arch Smith, W½ NW NW SE 25-15s-26w, 4 miles northwest of Garland City. IPP 35 BOPD (net), 10% b.s. & w., 20°, open hole 2,734-38 ft., TD 2,738 ft. New-field discovery.

Pope County:
Murphy Corp. 1 S. E. Lee Estate, NW SE 4-9n-19w, 1½ miles northeast of Scottsville. IP 1,098,380 CFGPD, 24-in., TP 308 psi., perf. 1,739-48 ft., Barton "B" sand; and 1,186,770 CFGPD, 24/64-in., TP 334 psi., perf. 1,936-47 ft., Hale sand. TD 2,690 ft. Discovery well of Scottsville field.

CALIFORNIA

Solano County:
Texaco Inc. 1 McCune, NE NE SW 32-8n-1e, gas well which began flowing oil in April after being shut in 9 months, flow ranging up to 154 B/D of 32°-gravity crude, perforations between 5,502-85 ft., TD 6,000 ft. (First oil found in Sacramento Valley. Well completed originally as gas well in Winters gas field. Nearest oil production about 90 miles to south.)

COLORADO

Adams County, Deertrail:
Delhi-Taylor Oil Corp. 1 Cowell, C SE SE 26-2s-60w. IPF 300 BOPD, 1% b.s. and w., ½-in. choke, "J" sand discovery, new field. "J" sand 6,332-33 ft. TD 6,400 ft.

Logan County:
B. F. Allison 1 Bollish-Ramey, C NW SW 13-9n-53w. IPP 90 BOPD, 18 BWPD, "J" sand discovery, new field. TD 4,855 ft.

Moran County, Ditch:
Richard F. Shaheen-Decker Drilling Co. 1 Reed, C SW SW 33-4n-58w. IPP 100 BOPD, "D" sand 5,685 ft. New field. TD 5,478 ft.

INDIANA

Posey County:
Inland Producing Co. 1 W. L. Thomson Community, NW SE NE 6-6s-14w. IP 103 BOPD, Tar Springs 2,270-2,285 ft. TD 2,285 ft. Opens East Maunie field.

Spencer County:
Cato Enterprises, Inc., 1 Connor, SW NE NE 12-5s-5w. IP 7 BOPW, Jackson 668-671 ft. TD 740 ft. Opens South Santa Claus field.
Shelby McIntosh 1 Gilbert Harris, NW SW NE 24-5s-5w. IP 10 BOPW, 10 BWPD, Aux Vases 925-931 ft. TD 931 ft. Opens Lamar field.
Shelby McIntosh 1 Herman Whitman, NE NW SW 22-5s-4w. IP 4 BOPD, 3 BWPD, Jackson 644-49 ft. TD 652 ft. Opens North Evanston field.

NEBRASKA

Cheyenne County:
Baumgartner Oil Co. - Falcon Seaboard Drilling Co. 1 Willson Ranch-B, C NW SE 20-17n-52w. IPP 145 BIOD, "J" sand discovery, new field. TD 5,426 ft.

Hitchcock County:
John Luccous 1 Bose, OWWO, OTD 4,930 ft. IPP 48 BOPD, Lansing-Kansas City, new field.

Redwillow County:
Burch Drilling Co. 1 Winter, OWWO, OTD 3,561 ft., C NW SE 27-2n-28w. IPP 120 BOPD, Lansing-Kansas City discovery, new field.
Sleepy Hollow field. Murfin Drilling Co. 1 Barth, C SE SW 25-3n-27w. IPP 144 BOPD, Cambrian discovery, new field. TD 3,490 ft.

NEW MEXICO

Eddy County:
Union Oil Co. of California 2-27 A. J. Crawford, 13 miles southwest of Malaga in 27-24s-26e. IPCAOF 7,200 M.c.f.d., Morrow 11,188-11,212 ft. TD 11,360 ft. New gas discovery.

Rio Arriba County:
Val R. Reese & Associates 1-25 Mesa, NW NW 25-24n-7w. IPF 1,723 M.c.f.d., ¾-in. choke, SICP 1,363 psi. Gallup 5,274-5,506 ft.; IPF 546 M.c.f.d., ¾-in. choke, TP 34 psi., SITP 2,005 psi., Dakota 6,264-6,433 ft. TD 6,557 ft. Dakota discovery, dual completion, new pool.

OKLAHOMA

Beaver County:
Vickers Petroleum Co. 1 Neufeld, C SW NE 11-1n-21eCM. IPF 11 M.M.c.f.d., Morrow 7,778 to 7,855 ft. TD 8,140 ft. New discovery.
Foree Drilling Co. et al. 1 Flock, C S½ SE NW 14-1n-25eCM. IPF 690 BOPD, Morrow 7,928-8,378 ft. TD 8,640 ft. New discovery.

Blaine County:
Texaco Inc. 1 E. A. Sallstrom, C SW NE 2-15n-12w. IPF 5,500 M.c.f.d., Morrow 9,754-9,807 ft. TD 10,253 ft.
Carter County:
Samedan Oil Co. 1 Westheimer, SE SW NW 19-7s-3e. IPF 633 BOPD, 40°, McLish 11,778-11,948 ft. TD 8,140 ft. New field.

Kingfisher County:
Marion Oil Co. 1 Cooper, SW SW 1-19n-6w. IP 300 BOPD, 40°, Manning 6,348-63, 6,370-77 ft.; Miss. 6,571-6,625 ft. TD 6,625 ft. Dual zone discovery.
Humble Oil & Refining Co. 1 Huntsberger, NW SW 11-19n-7w. IP 46,940 M.c.f.d., Miss. 6,992-7,174 ft., Manning 6,779-95 ft. TD 7,222 ft. New producing zone in area.

McIntosh County:
New Era Royalty Co. 1 Mathews, NW SE SW 5-12n-17e. IPF 4,446 M.c.f.d., basal Atoka 2,070-90 ft. TD 2,445 ft.

Major County:
Oklahoma Natural et al. 1 Arthur Eck unit, NW NW SE 15-22n-11w. IP 555 BOPD, Cherokee 6,585-6,626 ft., Manning 6,730-84 ft. TD 6,840 ft. Dual zone discovery.

Okmulgee County:
Webco Drilling Co. 1 Hendrickson, C NE 8-11n-13e. IPF 1,500 M.c.f.d., Jefferson 2,644-46 ft. TD 2,701 ft.

Osage County:
Jack Shortail 1-A Osage, C NE NE NW 22-21n-11e. IP 12 BOPD, Tucker 1,896-1,906 ft. TD 2,014 ft. Gross Drilling Co. 3 Swanson, NW NE SW 20-24n-4e. IP 20 BOPD, 36°, Endicott 1,481-1,500 ft. TD 1,500 ft. Northwest Belfort discovery.
Apache Oil Corp. 1 Osage, NE NE NE 7-25n-3e. IP 23 BOPD, 1 bsw., Miss. Chat 3,815-25 ft. TD 3,825 ft.

Stephens County:
R. H. Davenport 1 Mansell, NW NE NW 8-1s-9w. IP 30 BOPD, 35°, Keys sand 2,209-11 ft. TD 2,426 ft.

Texas County:
Phillips Petroleum Co. 1 Bees "A," C SE NW 25-2n-14eCM. IPF 3,203 M.c.f.d., Morrow 6,737-54 ft. TD 7,050 ft.
Thomas and Brewer 1-1 Sealey, C SE NW 1-5n-11eCM. IPF 52 BOPD, Morrow 5,542-48 ft. TD 5,832 ft.

Woods County:
Ashland Oil & Refining Co. 1 Gerloff, C NW SE 27-27n-18w. IP 7.7 M.c.f.d., Tonkawa 4,800-6 ft. TD 5,735 ft.

UTAH

Grand County:
Belco Petroleum Co. 1 Jim Creek unit, SW SE 10-16s-25e. IPF 612 M.c.f.d., ⅝-in. choke, TP 25 psi., CP 136 psi., 4 bbl. cond., 2 bbl. water 33 hours, shut-in gas well. Morrison notch 5,184-85 ft. TD 5,725 ft. Morrison discovery, new field.

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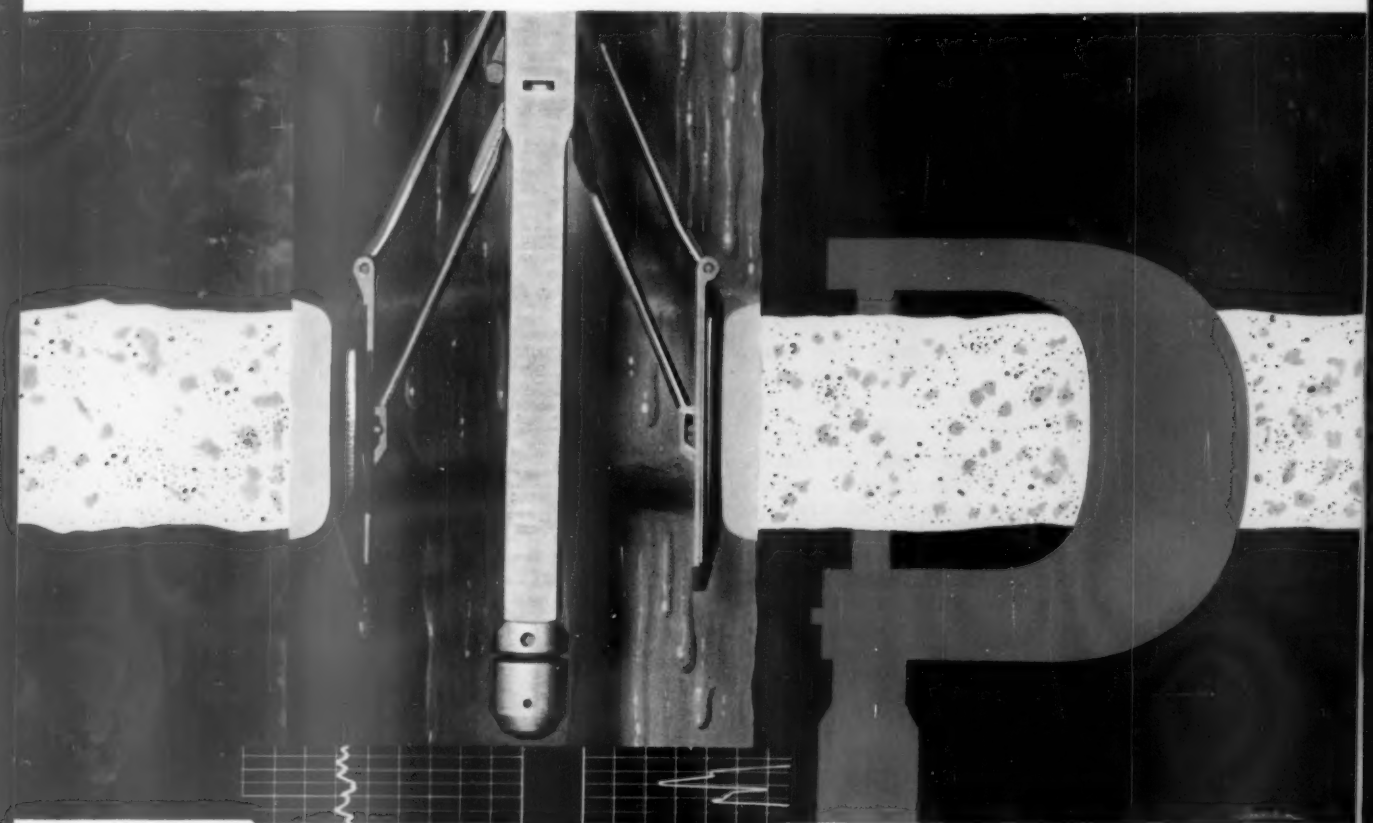

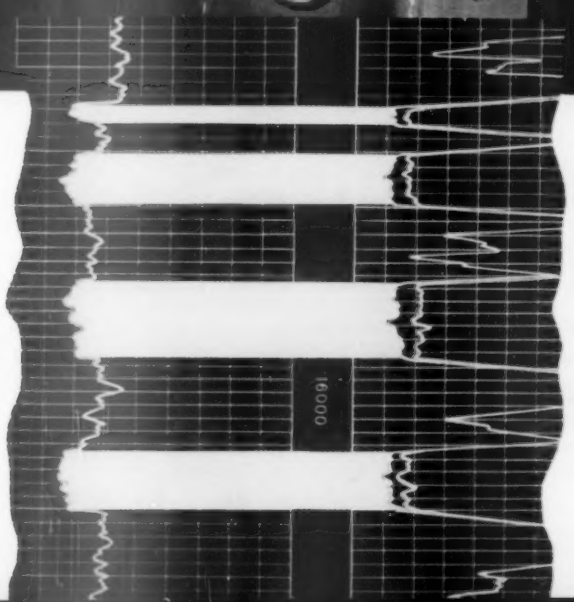

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SCHLUMBERGER

View from an oilman's club in Houston of the Gulf Building, home of The National Bank of Commerce.

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A healthy skepticism is a good thing, whether it is concerned with a friend's version of his fishing trip or whether a salesman is trying to take you to the top of the mountain.

But, whatever skepticism you may have about the future of Houston as an important oil center will vanish when you see what's going on here. The domestic operations for many major oil companies—Texaco, Humble and the Jersey group, Gulf, and Continental—are being domiciled in Houston. Others—such as Shell, Mobil, Pure, and Tidewater—maintain large offices. And more and more oil companies are finding it to their advantage to maintain a listening post here.

To keep in the center of domestic oil activity you, too, should consider an office in Houston. That's where we come in. As the principal bank for many of the largest companies in this area, The National Bank of Commerce of Houston is in a position to help you with contacts, advice, and, of course, all banking services.

The Oil and Gas department is qualified to help you in all fields of activity. Working closely with other bank departments—Loan, Trust, International Banking, Investment—you will find the same sort of service waiting for you that has made this *the* bank of Houston oil men.

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Ammann Wins Ferguson Medal

. . . for writing best technical paper of 1959 by a young engineer. His forte: Making complex oil problems simple.

CHARLEY Ammann climbed onto a vibrating rig floor to choke off a blowout in Kansas a few years ago. He helped bring the well under control in a little over 3 hours.

Ammann got no medal for that bit of bravery—but he's going to get one now, 6 years later—for writing the best technical paper of the year on a petroleum subject.

The AIME's Society of Petroleum Engineers has voted him the Cedric K. Ferguson medal for 1959 as author of the best paper during that year prepared by a society member under 33 years of age.

Ammann, now senior petroleum engineer in Tulsa with Sinclair Oil & Gas Co., will receive the medal at the society's annual meeting October 3 in Denver. His paper, "Case Histories of Analyses of Characteristics of Reservoir Rock from Drill-Stem Tests," was published in May by the Journal of Petroleum Technology. It earned him the honor.

Just now, Ammann is involved head over heels in primary and secondary studies with special emphasis on gas areas.

He has developed and processed volumes of material for use before state regulatory bodies. Tackling engineering oil field problems is his meat. It's his vocation, his avocation, and his "loafing time" hobby.

Charles B. Ammann
. . . he makes work his hobby.

Sea-bottom sleuth . . . Ammann was in the seventh grade when he made up his mind — and publicly announced it—to be a petroleum engineer for life. It wasn't a difficult decision.

Ammann was born in Wichita Falls, Tex. His father held real estate and oil investments, and oil talk was mealtime routine. His older brother operated a photogrammetric engineering survey company. The brother sold him on petroleum engineering.

Ammann entered the University of Oklahoma in the summer of 1944, completed 21 hours before joining the U. S. Navy. Even in military service, he was sounding the earth's pulse.

As radioman third class on the U. S. S. Hydrographer, he aided in surveying Pacific Ocean bottoms adjacent to dozens of islands to chart possible landing routes for big craft. He returned to Oklahoma after a 2-year hitch, and received his petroleum engineering degree in 1951.

A few months' stint with Southeastern Drilling Co. at Odessa followed. In January 1952 Ammann became a Sinclair roustabout at Kiefer, Okla., made field work stops in Drumright, Oklahoma City, and Covington before becoming western Kansas district engineer for Sinclair at Chase, Kans. Here, with the help of his crew, he nipped a bad well's spree in the bud.

For the last 5 years, Ammann has been in the engineering section of Sinclair's Tulsa division production department. Currently, he is doing reservoir and production engineering work.

Ammann has a talent for whittling tough and technical engineering terms and expressions down to size for lay consumption when it's necessary. He is an alert, forceful, confident witness. He convinces anyone in earshot that the engineers' appraisal of what's going on deep in the ground is logical, right, and information on which to bank.

He is a member of AIME, the API, the Society of Professional Well Logging Analysts, and the Society of Texas Engineers. He was active in dramatics in early school years. This art stands him in good stead in his public appearances for Sinclair.

▶▶▶ Personals

Dr. Paul E. Burton has joined Esso Research & Engineering Co. in Linden, N. J., as research chemist.

H. A. Platt, field project engineer at Signal Oil & Gas Co.'s Bankline refinery, Bakersfield, Calif., has been transferred to Signal's Los Angeles office as project engineer.

J. W. Marshall, district geologist in Roswell, N. M., for Sunray Mid-Continent Oil Co., has been promoted to staff regional geologist for the southwestern division in Midland, Tex. **W. Russell Click,** Abilene, Tex., district geologist, will succeed Marshall in Roswell. Click will be succeeded by **Don W. Rector,** senior geologist in the Wichita district.

George J. Sella, Jr., has been named sales manager for American Cyanamid Co.'s rubber chemicals department.

Dr. Kenneth L. Olivier, formerly with Du Pont Co., has joined Union Oil Co. of California as research chemist in Brea, Calif.

Dr. J. A. Acciarri, Ponca City, Okla., has been named senior chemical engineer in Continental Oil Co.'s petrochemical research division, research and development department.

Dr. Jack Milgrom, formerly with Standard Oil Co. (Ind.), has joined General Tire & Rubber Co. as a senior chemist.

Dr. D. G. Walker has been promoted to senior research chemist in the Baytown, Tex., research and development division of Humble Oil & Refining Co.'s Humble division.

E. Lynn Geralds has been named engineering representative and manager of sales in the Lafayette, La., area for J. Ray McDermott & Co., Inc. He succeeds **Dale Hart,** who recently resigned. **John Lognion** will continue as superintendent of operations in Lafayette.

▶▶▶ Personals

Marion J. Epley, Jr., vice president and assistant to the chairman of Texaco Inc., has been named senior vice president in charge of world-wide sales. He succeeds the late Harris T. Dodge. **Kerryn King,** vice president in

EPLEY

KING

charge of the employe and public relations department, has been named vice president and assistant to the chairman, succeeding Epley. King will have executive responsibility for the employe and public relations department. **Ben Halsell,** director of advertising and sales promotion, has been elected vice president, employe and public relations department. Epley has been with Texaco since 1947. He became assistant to the chairman and a vice president in 1958. King joined the company in 1953.

E. V. Murphree, president of Esso Research & Engineering Co., has been appointed general chairman of the annual meeting of American Association for the Advancement of Science. The meeting will be held December 26 through 31 in New York.

J. L. Harper has joined the quality-control department of Monsanto Chemical Co.'s plastics division plant in Texas City. **Dr. Raymond A. Newsom** has joined the Texas City plant research department. **Dr. Robert B. Grainger, Dr. Kurt Nowotny,** and **Dr. Terrill D. Smith** have joined the research department of Monsanto's organic chemicals division in St. Louis.

J. L. Christian, vice president and general manager of Monsanto Chemical Co.'s inorganic chemicals division, has been named vice president of manufacturing, a director, and member of the executive committee. **Edward J. Bock,** an assistant general manager in inorganic chemicals, has been elected a vice president and will succeed Christian as general manager, inorganic chemicals. **Tom K. Smith,** also an assistant general manager in inorganic chemicals, has been elected vice president and general manager of the new agricultural chemicals division.

Thaddeus S. Stojeba, engineer with the Federal Power Commission, has been transferred to Tulsa from Pittsburgh.

G. M. Anderson, Shreveport, La., independent operator, has been named a representative on the Interstate Oil Compact Commission by Louisiana **Governor Jimmy Davis.** Anderson succeeds **W. L. Stokes** of Lafayette.

Harry Ottinger has been named head of the coordination division's major products planning section in the coordination and petroleum economics department of Standard Oil Co. (N. J.). He had been on a loan assignment with Esso A.G.

A. V. Snider, product development manager in Shell Chemical Co.'s industrial chemicals division, has been named product development manager in the synthetic-rubber division, a new position. **J. B. Larkin** and **K. H. Schmidt** will be technologists in product development. Snider joined Shell Development Co. as a junior chemist in 1941. He was manager of Shell Chemical's export department in New York before assignment to the industrial chemicals division last year.

George A. Gumbs, Jr., vice president of Esso Tankers, Inc., and **George T. Piercy,** manager of the coordination and petroleum economics department of Standard Oil Co. (N. J.), have been elected directors of Esso Tankers. Gumbs has also been named a member of the executive committee.

Gus Athanas, superintendent in the Pembina production area of Pan American Petroleum Corp., has been promoted to superintendent of the new Calgary production district. **E. R. Wagner** has been named area superintendent for the new Whitecourt, Alta., production office. He will be on temporary assignment in Tulsa working with design of a natural-gas plant which Pan Am will build in Alberta's Windfall field. The Whitecourt area office will handle construction and operation of the plant. **R. A. Lofland,** plant foreman, will be supervisor in charge at Whitecourt during Wagner's Tulsa assignment. In other appointments, **G. J. Last** has been named district engineer, production, in Calgary. **J. D. Burns** has been named to succeed Athanas as superintendent of the Pembina production area. **A. S. Anderson** has been appointed production district clerk in Edmonton succeeding **F. W. Just,** who has been transferred to Calgary in the same capacity. **G. E. Goss** has been named Edmonton area clerk.

Harry M. Schafer, manager of distribution for Union Oil Co., has retired after 32 years with the company.

Edward M. Smith, field representative for Ethyl Corp., has been transferred to Corpus Christi, Tex., from Detroit.

Robert N. Crozier, reservoir engineer with Texaco Inc., has been transferred to Bakersfield, Calif., from Los Angeles.

Raymond Higgins, land man for Murphy Corp., has been transferred to El Dorado, Ark., from Denver. **Harry Simmons,** land man in El Dorado, has been transferred to the Denver division.

Floyd B. Inks, Jr., area drilling engineer with Gulf Oil Corp., has been transferred to New Orleans from Triumph, La., in a relocation of the area office.

Gilbert Wood, Jr., and **Floyd Swabb** have formed Petroleum Consultants Associates in Tulsa. The new company will offer complete petroleum consulting services. Wood was with Phillips Petroleum Co. and International Petroleum Co. before becoming a consultant in 1957. Swabb formerly was geologist with Sun Oil Co. and also was with the old Mid-Continent Petroleum Corp. at one time.

R. A. Parsley, Jr., marketing coordinator for Esso Mediterranean, Inc., in Geneva, has been appointed manager in Libya for Esso Standard (Near East), Inc. He succeeds **E. P. O'Sullivan,** who has been given a special assignment with Esso Mediterranean. Parsley has been with the Standard Oil Co. (N. J.) companies since 1933. He was vice president and a director of Esso Standard (Near East) before joining Esso Mediterranean last year.

Ed Yoder, a department head at Union Carbide Chemical Co.'s Texas City plant, has been transferred to United Carbide International Co. in Houston. He will do design and engineering work. **Bill Parkey,** project engineer, will succeed Yoder in Texas City. **Roy Burson** and **Jack Lindsey,** foremen at the Texas City plant, have been transferred to Union Carbide Corp.'s Brownsville, Tex., plant as shift superintendents. The Brownsville plant, formerly synthetic fuels plant of Amoco Chemicals Corp., is being converted to petrochemicals by Union Carbide. **Vergil Fredieu, H. V. Garrison,** and **L. E. Murff** have been assigned to Brownsville as area shift foremen.

▶▶▶ Personals

B. R. Fraser, manager of the manufacturing department of Mobil Oil Co., Ltd., has been elected director of manufacturing. He succeeds **J. Blake Middleton,** who will retire early next year.

James A. Petrie, Jr., vice president and a director of Kellogg International Corp., London, has been appointed assistant to the president. Petrie is also an assistant vice president of M. W. Kellogg Co., New York, the parent company.

William R. Walton, staff geologist in Pan American Petroleum Corp.'s Houston office, has been named division consulting geologist for the Gulf Coast division. Walton joined Pan Am in 1957 as a senior geologist. He was named staff geologist in 1958.

S. K. Van Steenbergh, division exploration superintendent for Sinclair Oil & Gas Co.'s Houston division, has been named exploration superintendent in the Tulsa division. He succeeds **D. L. Dobie,** who recently was named assistant manager of the Tulsa division. **Z. D. Grissom,** district manager for Sinclair in Alaska, will succeed

Van Steenbergh

Grissom

Van Steenbergh in Houston. **R. R. Gahring,** senior geologist in Anchorage, will move up to succeed Grissom as district manager. Also, **Robert W. Bayliss,** senior land man, has been promoted to staff land man, Tulsa division. Van Steenbergh was with Texaco Inc. and Brown Geophysical Co. before joining Sinclair in 1942. He had been Houston exploration superintendent since 1957. Grissom was division geologist in Tulsa before being named Alaska district manager last year.

Dr. G. F. Kirby, vice president, will direct new products development and commercialization for Ethyl Corp. **J. A. Costello,** adviser on marketing and contracts, will coordinate new products work with chemical sales. **Robert Herzog** has been named director of planning for Ethyl and will continue as assistant to the vice president in charge of operations. **Arthur W. Helwig** has been named superintendent of long-range planning.

Frank P. Frascati has been promoted to senior research chemical engineer at the Beacon, N. Y., research center of Texaco Inc. **Richard P. Love, David D. Reed,** and **Frederick G. Oberender** have been named senior chemists, Beacon.

J. C. Weisinger has been promoted to petrochemicals section staff engineer in the technical division of Humble Oil & Refining Co.'s Baytown, Tex., division. He will work with economic evaluations of new petrochemical projects.

J. H. Dunn, president of Shamrock Oil & Gas Corp., has been named chairman and chief executive officer. **C. A. Cash,** executive vice president, will succeed Dunn as president. **Bill J. Montgomery** has been elected vice president in charge of finance.

P. H. Swinchatt, assistant to the president of Shell Oil Co. and vice president of Shell Pipe Line Corp., will retire December 31 after nearly 40 years with Shell. He will be succeeded by **E. A. Hugill, Jr.,** who will continue as secretary of Shell.

Maurice Coffman and **Edgar Splittgerber,** junior engineers with Northern Natural Gas Co., have been promoted to systems engineers in the Omaha office.

Charles E. Terrell, superintendent of Southern Natural Gas Co.'s measurement department since 1930, has retired. Terrell has been active in gas industry association work and is serving as editor of the American Gas Association's forthcoming gas-measurement manual.

A. L. Vaughan has been named vice president of Northern Natural Gas Co.'s operating division. **W. B. Haas** has been designated vice president, engineering and construction. **Pat McDonough** has been named manager of the construction department with **Byron Francis** as special problem assistant to Haas.

Gordon A. Leslie, senior geologist for Trans-Canada Pipe Lines, Ltd., has been appointed assistant manager of the gas-supply department. He will headquarter in Calgary. **Edmund M. Foo,** senior engineer in the gas supply department, has been promoted to chief engineer, gas supply department, in Calgary. **G. Lorne Metcalfe,** engineer, gas supply department, has been promoted to senior engineer. **Norman E. Frost,** geologist, gas supply department, has been promoted to senior geologist.

GUNDERSON

David K. Gunderson has been named vice president and general manager of Double-A Drilling Co., Ltd., in Calgary. **Al Mundt,** Edmonton, will continue as drilling superintendent. Double-A recently was purchased by Llano Drilling Co., Midland, Tex. Gunderson, formerly with Regent Drilling Co., is a past president of the Canadian Association of Oilwell Drilling Contractors.

Alfred R. Crosby has been named an engineering associate for Esso Research & Engineering Co. Crosby has been with the company since 1947. He is a member of the general engineering division in Florham Park, N. J.

Klaus L. Mai has been transferred from Shell Chemical Co.'s Houston plant to the Martinez, Calif., chemical plant where he will be chief technologist. Mai joined Shell in Houston in 1959. At Martinez he succeeds **Neil McKay,** who has been transferred to New York.

New vice presidents of Mobil Oil Co. de Venezuela are **Hamilton T. Caldwell,** manufacturing; **J. Howard Casey,** producing; **Karl F. Madsen,** marketing; and **Joseph H. Poe,** finance and industrial relations. Madsen and **John C. Thompson,** comptroller and treasurer, were named directors.

Frank Pyle, vice president, plastics, for Spencer Chemical Co., has been named vice president and assistant to the president. **Harold Dinges,** vice president of industrial chemicals, will succeed Pyle as plastics vice president. **E. V. Friedrich,** vice president, administration, will direct plastics division activities. **Byron Kern,** vice president of agricultural chemicals, will be vice president, agricultural and industrial chemicals.

Donald J. Miller, staff assistant to the assistant general manager of Monsanto Chemical Co.'s plastics division in Texas City, has been appointed product administrator, polyethylene, for the division. **Burgess E. Drane** has joined the plastics division engineering department in Texas City. **Robert L. Bourget** and **Don R. Clay** have joined the production technical service department, plastics division, in Springfield, Mass.

Personals

W. J. Wooten, manager of Texas Gas Exploration Corp.'s land department, has been elected vice president and manager of exploration. He will be responsible for supervision of the company's land and geological departments. Wooten was with the old Magnolia Petroleum Co. before joining Texas Gas Exploration in 1957.

Clarence Kallson, geologist with Ohio Oil Co., has been transferred to Sidney, Neb., from Bismarck, N. D. **Paul McDaniel,** geologist in Sidney, has been transferred to Casper, Wyo., and **Marion Scholes,** geologist, has been transferred to Rawlins, Wyo., from Sidney.

Herbert H. Olfe has been named chief engineer of Tellepsen Petro-Chem Constructors, Houston. He succeeds **H. K. McLaughlin.** Olfe was partner in a Pittsburgh construction firm before joining Tellepsen in 1957. He also has been with Shell Oil Co. and Olin Mathieson Chemical Corp.

Dr. James H. Lum, director of technology for Monsanto Chemical Co.'s organic chemicals division in St. Louis, has been appointed assistant to the president of Monsanto and secretary of the company's executive committee. He succeeds **Shea Smith III,** who has been named director of economic planning for the overseas division, a new position. Shea will headquarter in St. Louis. Lum was director of research and development in the organic chemicals division before his appointment as director of technology earlier this year.

E. F. McGee, manager of Shell Oil Co.'s Sacramento marketing division, has been named manager of the Detroit marketing division. **P. G. Drew,** sales assistant to the vice president of West Coast marketing divisions, will temporarily take over as Sacramento division manager. **E. J. Cowing,** sales manager in the St. Louis marketing division, has been named sales assistant to the vice president, East Coast marketing divisions. He succeeds **S. C. Burnet,** who has returned to Shell Oil Co. of Canada, Ltd., in Toronto. **G. S. Morrison,** manager of administrative services marketing in Toronto, has joined Shell Oil in New York as a special assistant to the general manager of marketing.

Charles Carraway is now in charge of the Evansville, Ind., office of James A. Lewis Engineering, Inc. He succeeds **John M. Penrod,** who recently was named manager of the company's new Wichita office.

Benjamin W. Hurst, resale manager for Mobil Oil Co. in Kansas City, has been named merchandising manager of the resale programs department. **Arthur E. Burgeson** has been appointed assistant manager of industrial sales for Mobil.

A. R. Ratti has been promoted to assistant land superintendent for Continental Oil Co.'s southwestern region in Fort Worth. He will succeed **Hanes M. Dawson,** who recently was named western region land superintendent in Los Angeles.

D. B. Edmondo has been named superintendent of catalytic operations in the refining division of California Oil Co. **C. V. Shireman** has been named superintendent, operations planning, and **J. J. Cullen** has been named superintendent, manufacturing and utilities.

Five certificates of service will be awarded AIME's Society of Petroleum Engineers at the SPE fall meeting in Denver October 2-5. Those receiving the awards are **Alfred H. Bell,** Illinois Geological Survey, Urbana, Ill.; **Raymond M. Larsen,** U. S. Geological Survey, Casper, Wyo.; **Lawrence W. Chasteen,** Union Oil Co., Los Angeles; **James Terry Duce,** formerly with Arabian American Oil Co., Woodside, Calif.; and **Herbert F. Beardmore,** Gulf Oil Corp., Houston.

Howard E. Padgett, a construction superintendent with M. W. Kellogg Co., has joined Crawford & Russell, Inc., Stamford, Conn., as construction manager of the southern division.

Neal E. Porter, gas-test supervising engineer for Phillips Petroleum Co. in Guymon, Okla., has been promoted to gas production and reservoir engineer and transferred to Bartlesville, Okla.

T. G. Dorough is president of Rio Oil Co., new Gillette, Wyo., exploration firm. Other officers are **W. R. Gibson, Jr.,** vice president, and **W. James Saul,** secretary-treasurer. **Rex H. Baker,** Billings, Mont., and **H. P. Macauley,** Denver, are directors.

L. W. Smith, San Joaquin division exploration manager for Shell Oil Co., has been named manager of the new California exploration division, formed by consolidation of the old San Joaquin and coastal exploration divisions. **C. T. Crewell,** formerly coastal division land manager, has been named manager of the California land division. Division headquarters will be in Bakersfield. Four districts operating under the new division will be Salinas, Sacramento, Bakersfield, and Ventura. **Adrian Maaskant,** district geologist, and **R. D. Kerick,** district land agent, have been assigned to the Sacramento district. **A. R. Weller** will be Salinas district geologist, with **W. F. Anderson** as district land agent. In Bakersfield, **C. W. Prewett** will be district geologist and **A. F. Nelson, Jr.,** will be district land agent. In Ventura, **R. L. Blocher** is district geologist, with **R. F. Karshner** as district land agent.

Deaths

Carl Myers, 66, retired vice president of Tennessee Gas Transmission Co., died August 30 in a Houston hospital after a long illness. Myers was treasurer of TGT before being named vice president in 1951. He retired in 1958.

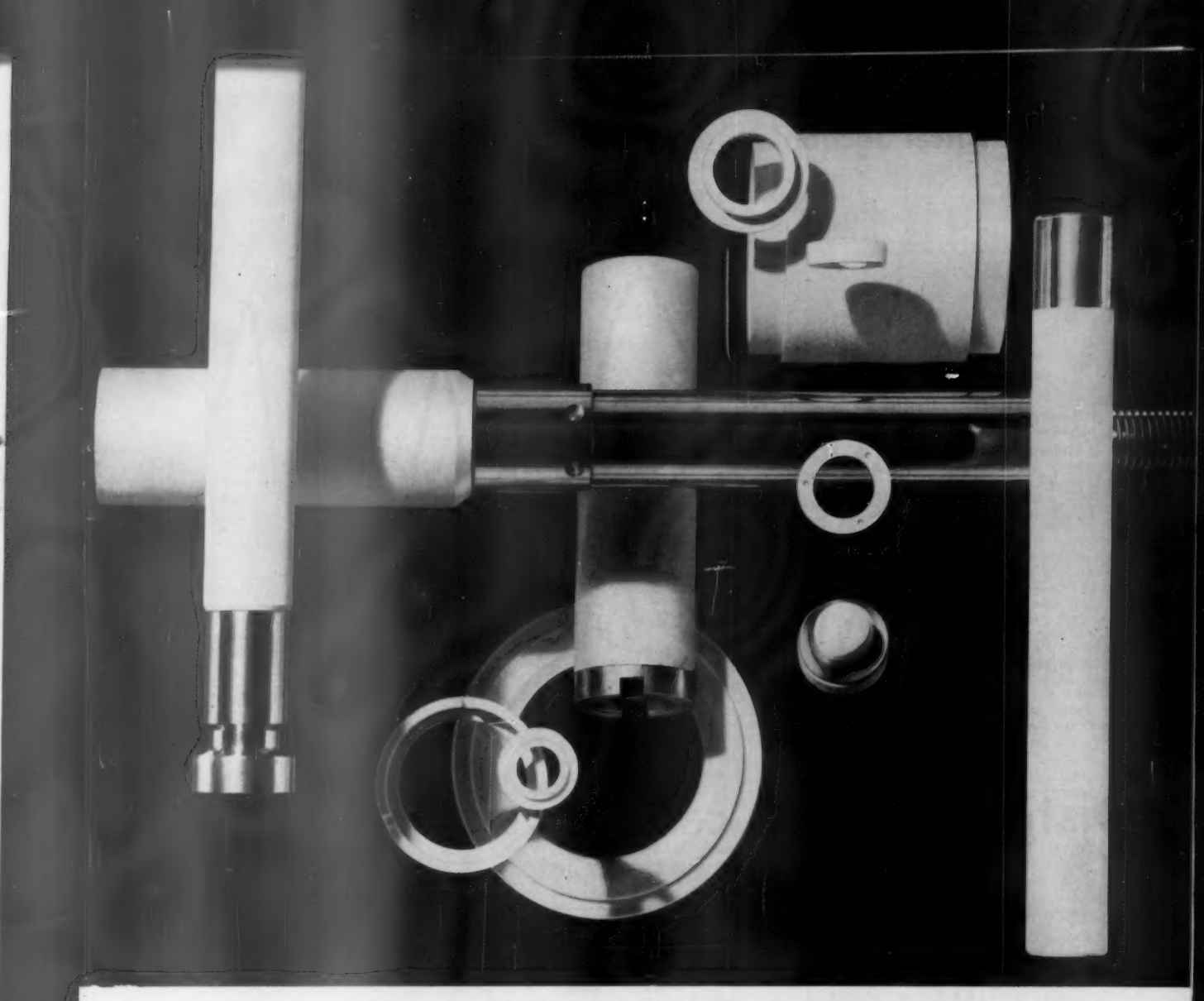
Roy James Long, 66, retired production foreman with Phillips Petroleum Co., died September 3 in a Fairfax, Okla., hospital. Long was with Phillips 40 years before retiring in 1958.

J. Paul Jackson, a director of Murphy Corp. since 1955, died August 23 after a long illness. Jackson was senior partner in Jackson, Walker, Winstead, Cantwell & Miller, Dallas law firm.

John Miller Christensen, 35, owner of Hallmark Oil Co., Arkansas City, Kans., and formerly operator of Criswell Drilling Co., Arkansas City, died September 2 in a Tulsa hospital of a heart ailment.

William N. Hooper, 68, Houston independent operator, died September 4 at his home after a heart attack. Hooper organized W. N. Hooper Oil Co., first company in Conroe field, in 1932. In recent years he had been active in banking, real estate, and ranching in the Houston area.

Willis M. Powell, 66, vice president of Brown & Root, Inc., died September 5 at his Houston home. He had been with Brown & Root since 1935.



Leading Oil Field Pump Manufacturers Use Coors Alumina Ceramics to Fight Abrasion

Waterflood is hard on pumps! That's why leading pump manufacturers are supplying plungers of Coors Ceramic for their multiplex pumps. Users find these ceramic plungers wear several times longer than plungers of expensive metals.

Coors Alumina Ceramics are extremely hard — equal to a sapphire in hardness. This property makes the plungers very resistant to abrasion, plungers do not easily score nor wear down in the areas contacting the packing. The very smooth surface finish is maintained over a long period, greatly increasing packing life. The ceramic is chemically inert — it does not corrode nor pit in service. It has a tensile strength of 17,000-18,000 PSI and a compressive strength of over 240,000 PSI.

Manufacturers of positive displacement metering and proportioning pumps find plungers of Coors Alumina Ceramics give long, accurate service — because of its hardness and abrasion resistance, and its chemical inertness.

Coors Alumina Ceramics are also used in rock bit nozzles, chokes, ball check valves, and sleeve protectors for multiple completion wells.

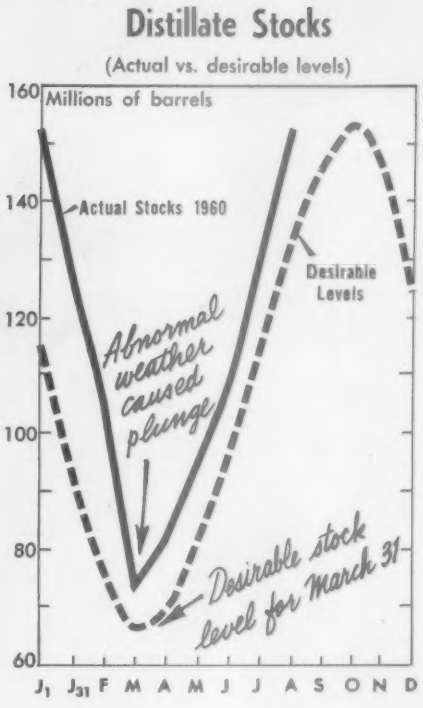
Chokes of Coors Ceramics are available through oil field stores. Pump plungers and other ceramic parts are available only through the equipment manufacturers. Coors does not supply direct, but we will be glad to give you names of all manufacturers using our ceramic in their equipment. If you are having abrasion or corrosion problems, ask your equipment manufacturer about Coors Alumina Ceramics!

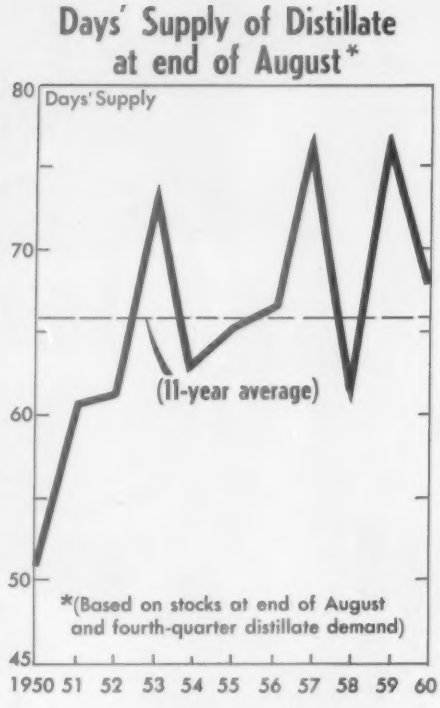
Coors **Alumina Ceramics**

COORS PORCELAIN COMPANY • 600 NINTH STREET, GOLDEN, COLORADO

LAST SPRING, companies reporting to the Texas Railroad Commission gave estimates of desirable stock levels for April 1 and November 1. The average of reports from 14 of these companies showed that distillate stocks should be down to 65,000,000 bbl. at the end of March and should climb no higher than 160,300,000 bbl. by the end of October.

The second chart is based on reported stocks for August 31 and daily average demand for distillate in the fourth quarter.





Distillate stocks call for cut in runs

BY JOHN C. CASPER

IT'S TIME for refiners to take a critical look at distillate stocks. They will find that four facts stand out like sore thumbs.

... Cold weather last March cleaned out part of the surplus distillate at the end of the heating season. This extra sale of 20 million barrels can't be included in plans for the coming winter.

... Even with the cold March weather, distillate stocks have been above desirable levels all this year.

... Distillate inventories at the end of August came within a million barrels of what should be the peak this year.

... Distillate stocks don't level off until sometime in October. Normal gains will add about 18 billion barrels over the next 2 months.

Take a look at the first chart. Actual 1960 inventories have been plotted against a curve of desirable stock levels for the year. The desirable-level curve is based on company reports to the Texas Railroad Commission and the average seasonal pattern for the 1955-59 period.

Based on this curve, distillate stocks were 31.7 million barrels too high at the first of March and only 8.4 million high at the end of that month. By the end of August, distillate was back in the old groove with stocks climbing faster than the rate shown by the desirable curve. The total was about 17 million too high.

Note that the curve of actual inventories has been above the desirable stock level all this year.

The second chart shows days' supply at the end of August. Points are based on stocks for August 31 divided by daily average demand in the fourth quarter. Demand in the fourth quarter was used because refiners don't start selling out of inventories until late in October.

Average days' supply for the 1950-60 period was 66.1 days. Note that in 4 out of the past 5 years, days' supply at the end of August was above the 11-year average.

If refiners expect to hit the desirable-level target for the end of October, they must add no more than 2 million barrels to distillate inventories during September and October.

Such a program calls for a cut in runs.

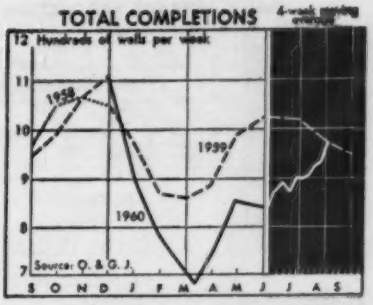
A quick look at the highlights . . .

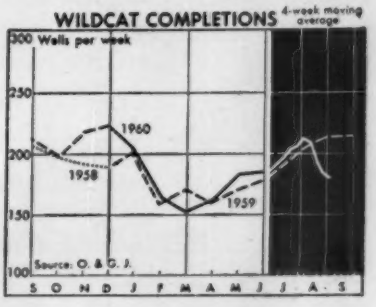
	LATEST WEEK	Change from WEEK AGO		Change from YEAR AGO	
Production	6,840,340	DOWN	9,850	UP	33,220
Crude stocks	236,231,000	DOWN	2,077,000	DOWN	17,122,000
Completions	1,060	UP	77	UP	69
Refinery runs	8,294,000	UP	122,000	UP	162,000
Gasoline stocks	188,665,000	DOWN	2,015,000	UP	7,156,000
Kerosine stocks	33,884,000	UP	1,557,000	UP	2,530,000
Distillate stocks	153,023,000	UP	4,057,000	DOWN	10,175,000
Residual stocks	47,297,000	UP	1,988,000	DOWN	10,210,000
Four-product stocks	422,869,000	UP	5,587,000	DOWN	11,699,000
Total imports	1,403,300	DOWN	65,600	DOWN	304,100

Active Rotary Rigs

	9-5-60	8-29-60	9-7-59
Alabama	4	5	9
Alaska	7	7	(†)
Arkansas	11	11	18
Arizona	0	1	2
California	76	86	106
Land	75	85	100
Offshore	1	1	6
Colorado	51	47	55
Florida	2	2	1
Land	2	2	1
Offshore	0	0	0
Illinois	35	41	48
Indiana	11	8	9
Iowa	0	0	2
Kansas	105	102	135
Kentucky	2	3	8
Louisiana	271	266	326
North	28	27	34
S. Inland waters	93	107	125
S. Land	89	74	105
Offshore	61	58	62
Maryland	1	1	0
Michigan	38	32	30
Mississippi	50	50	70
Missouri	1	1	0
Montana	26	25	31
Nebraska	19	16	31
Nevada	1	0	2
New Mexico	108	112	122
New York	1	1	0
North Dakota	14	12	19
Ohio	5	6	3
Oklahoma	163	163	220
Oregon	1	1	0
Pennsylvania	12	10	8
South Dakota	3	2	6
Tennessee	2	2	0
Texas	583	562	745
S. Inland waters	3	2	5
S. Land	164	178	196
Offshore	1	1	2
North	51	45	176
Panhandle	48	44	(*)
East	50	42	(*)
West Central	154	144	241
West	112	106	125
Utah	31	28	31
Washington	1	1	2
West Virginia	5	5	5
Wyoming	58	59	88
Total U. S.	**1,698**	1,668	2,132
Western Canada	149	159	150
Eastern Canada	1	1	1
Grand total	1,848	1,828	2,283

Hughes Tool Co. report. *Included in North. Comparisons not available due to change in method of reporting. †Data first reported 4-4-60.





WEEKLY WELL COMPLETIONS . . . WEEK ENDED SEPTEMBER 3, 1960

	Total wells							Cum.		Total wildcats					Cum.	
	Total	Crude	Cond.	Gas	Dry	Service	Footage	1960	1959	Total	Crude	Cond.	Gas	Dry	1960	1959
Alabama	0	0	0	0	0	0	0	32	65	0	0	0	0	0	2	17
Arizona	0	0	0	0	0	0	0	25	.....	0	0	0	0	0	18	.....
Arkansas	8	6	0	1	1	0	32,835	402	565	1	0	0	0	1	111	97
California	27	13	0	4	10	0	128,043	1,107	1,027	7	0	0	0	7	212	256
Colorado	13	2	0	2	9	0	59,264	423	529	9	0	0	1	8	215	315
Illinois	71	21	0	0	16	34	129,736	1,503	1,531	5	0	0	0	5	308	262
Indiana	27	6	0	1	20	0	38,764	680	559	10	1	0	1	8	253	190
Kansas	147	51	0	6	88	2	297,231	2,352	2,715	18	3	0	0	15	696	649
Kentucky	86	5	0	1	8	72	88,064	1,313	1,643	0	0	0	0	0	118	161
Louisiana	95	48	3	8	36	0	738,492	2,380	2,506	14	1	0	0	13	374	337
North	41	20	0	8	13	0	139,526	889	956	5	1	0	0	4	179	145
South	48	24	3	0	21	0	536,960	1,155	1,284	9	0	0	0	9	172	179
Offshore	6	4	0	0	2	0	62,006	336	266	0	0	0	0	0	23	13
Michigan	14	4	0	1	9	0	49,407	590	425	4	0	0	1	3	156	107
Mississippi	15	8	0	0	7	0	156,890	467	420	6	1	0	0	5	178	191
Montana	6	3	0	0	3	0	31,209	202	217	3	0	0	0	3	96	68
Nebraska	14	7	0	0	7	0	74,272	595	597	6	1	0	0	5	242	253
New Mexico	29	19	0	7	3	0	148,125	1,244	1,379	3	0	0	0	3	191	163
West	11	5	0	5	1	0	59,568	413	627	1	0	0	0	1	46	44
East	18	14	0	2	2	0	88,557	831	752	2	0	0	0	2	145	119
New York	18	8	0	0	3	7	22,770	223	195	0	0	0	0	0	26	18
North Dakota	5	4	0	0	1	0	28,431	201	335	1	0	0	0	1	53	62
Ohio	21	4	0	3	5	9	56,083	684	659	0	0	0	0	0	35	21
Oklahoma	94	40	0	17	27	10	286,157	3,104	3,918	8	1	0	0	7	501	587
Pennsylvania	0	0	0	0	0	0	0	440	335	0	0	0	0	0	8	9
South Dakota	0	0	0	0	0	0	0	17	.....	0	0	0	0	0	6	.....
Texas	318	171	13	17	112	5	1,310,403	10,677	12,938	71	2	3	2	64	2,208	2,435
Dist. 1	24	11	0	1	12	0	72,881	737	759	10	0	0	1	9	277	217
Dist. 2	27	4	1	4	18	0	160,871	524	540	11	0	0	0	11	134	161
Dist. 3	23	10	1	2	10	0	131,352	823	824	3	0	1	0	2	152	165
Dist. 4	20	6	2	4	8	0	104,263	736	907	6	0	1	1	4	208	225
East	32	17	2	0	12	1	119,078	867	842	6	0	0	0	6	178	160
Dist. 7-B	41	19	0	3	18	1	111,399	1,551	1,772	11	0	0	0	11	449	472
West	79	60	2	1	15	1	381,825	2,795	3,968	16	2	0	0	14	435	550
Dist. 9	51	32	2	0	15	2	123,128	1,941	2,436	7	0	0	0	7	332	412
Dist. 10	21	12	3	2	4	0	105,606	703	890	1	0	1	0	0	43	73
Utah	1	1	0	0	0	0	5,726	168	211	1	1	0	0	0	57	57
West Virginia	28	2	0	25	1	0	75,680	549	522	1	0	0	1	0	6	19
Wyoming	21	8	0	1	11	1	101,340	705	668	10	0	0	1	9	286	227
Misc. (Alaska)	2	1	0	0	0	1	14,520	105	88	0	0	0	0	0	95	55
Total U. S.	1,060	432	16	94	377	141	3,873,442	30,188	34,047	**178**	11	3	7	157	6,451	6,556
Previous week	983	421	28	83	361	90	3,766,073	.....	.....	197	13	0	8	176	.....	.....
Cum. 1960	30,188	13,755	885	2,472	11,586	1,490	127,826,036	.....	.....	6,451	565	71	209	5,606	.....	.....
Cum. 1959	34,047	17,156	831	2,472	12,709	879	141,462,107	.....	.....	6,556	623	86	206	5,641	.....	.....
Western Canada	52	27	0	7	16	2	289,432	1,570	1,689	11	0	0	0	11	418	478

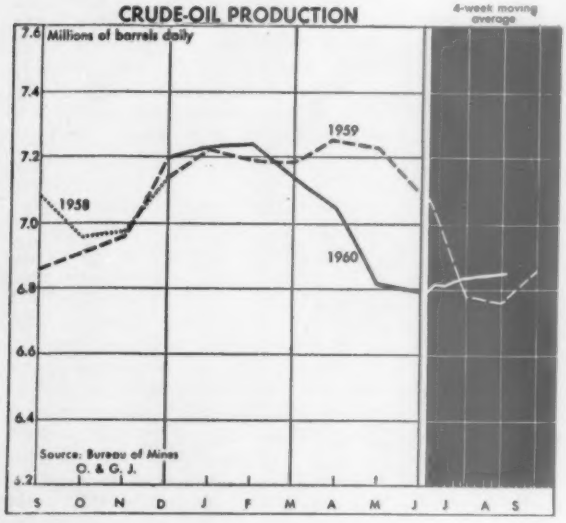
PRODUCTION

DAILY AVERAGE PRODUCTION FOR WEEK

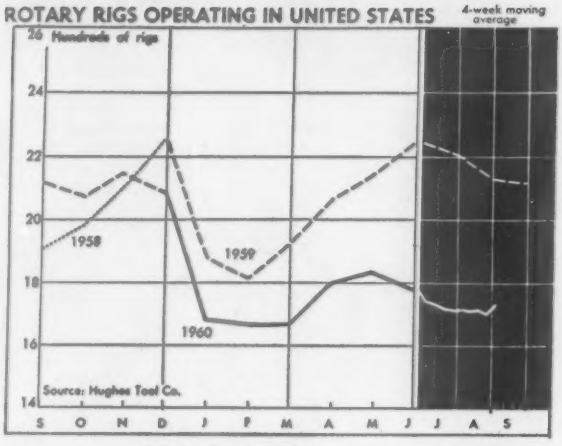
	September 3, 1960			Aug. 27
	Crude oil	Lease condensate	Total	total
Alabama	17,500	.....	17,500	17,400
Arkansas	79,850	200	80,050	80,000
California	833,100	.....	833,100	833,500
Colorado	133,000	.....	133,000	131,035
Eastern	40,200	.....	40,200	40,800
Florida	975	.....	975	1,000
Illinois	219,100	.....	219,100	220,200
Indiana	31,900	.....	31,900	31,200
Kansas	†294,615	.....	†294,615	†305,150
Kentucky	60,200	.....	60,200	59,900
Louisiana	949,175	123,400	1,072,575	1,066,825
North	105,750	5,900	111,650	111,550
South	843,425	117,500	960,925	955,275
Michigan	41,700	.....	41,700	41,500
Mississippi	131,025	3,550	134,575	135,025
Montana	83,650	.....	83,650	82,250
Nebraska	66,700	.....	66,700	67,550
Nevada	100	.....	100	100
New Mexico	289,275	8,000	297,275	294,975
North Dakota	65,900	.....	65,900	66,500
Oklahoma	†467,300	.....	†467,300	†484,400
Texas	2,361,425	81,500	2,442,925	2,437,825
Dist. 1	41,275	2,500	43,775	43,500
Dist. 2	96,575	8,000	104,575	104,400
Dist. 3	308,150	36,000	344,150	345,275
Dist. 4	167,425	12,200	179,625	179,025
Dist. 5	26,000	300	26,300	26,300
Dist. 6	106,850	9,800	116,650	114,375
East Texas field	122,575	.....	122,575	122,000
Dist. 7-B	128,275	125	128,400	127,550
Dist. 7-C	110,150	3,050	113,200	114,250
Dist. 8	953,575	7,000	960,575	958,425
Dist. 9	193,575	1,600	195,175	194,800
Dist. 10	107,000	925	107,925	107,925
Utah	96,700	.....	96,700	93,880
Wyoming	358,800	.....	358,800	357,650
Others	‡1,500	.....	‡1,500	‡1,525
Total U. S.	6,623,690	216,650	6,840,340	6,850,190
Change from prev. week, down			9,850	
Canada	454,800	.....	454,800	†529,800
Total U. S. prod., Jan. 1-Sept. 3			1,726,049,300 bbl.	
Same period last year (crude plus cond.)			*1,742,751,100 bbl.	

*Includes 46,093,800 bbl. condensate. †Week ended previous Monday. ‡Alaska, South Dakota, and Arizona.

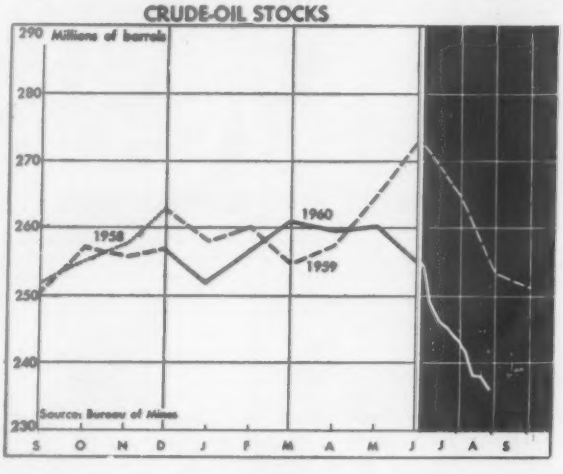
CRUDE-OIL PRODUCTION



ROTARY RIGS OPERATING IN UNITED STATES



CRUDE-OIL STOCKS

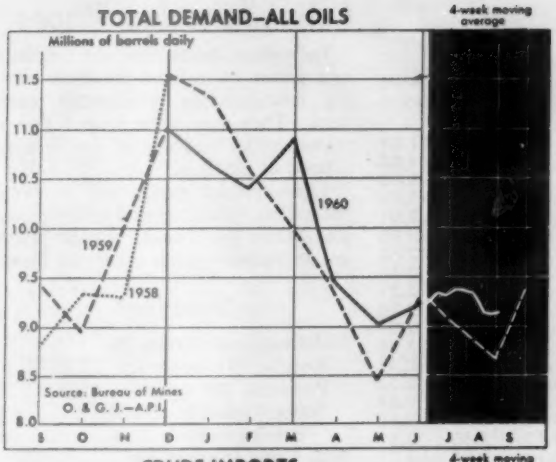


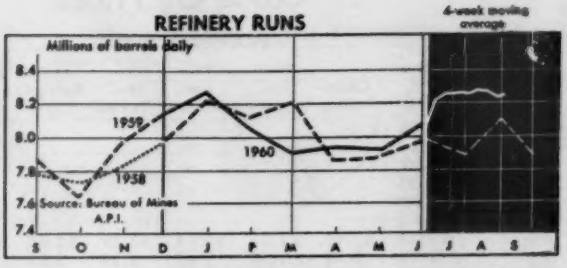
CRUDE-OIL STOCKS BY STATES OF ORIGIN*

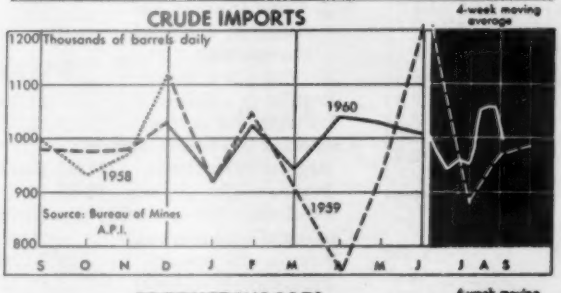
(Thousands of barrels)

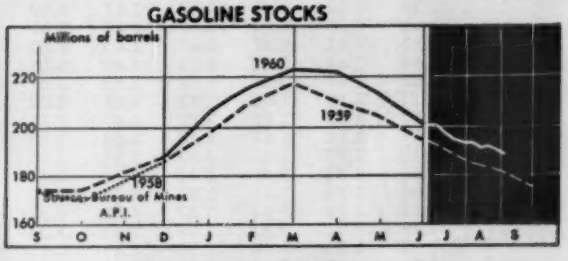
	8-27-60	8-20-60	9-29-59
Pennsylvania	2,341	2,348	2,692
Other Appalachian	1,576	1,690	2,085
Illinois, Indiana, Michigan	9,053	9,297	9,632
Nebraska and North Dakota	2,824	2,919	2,715
Kansas	8,786	8,549	10,066
Oklahoma	15,793	16,254	16,000
Arkansas	1,800	1,714	2,175
Louisiana	18,027	17,636	18,748
North	3,151	3,063	3,396
South	14,876	14,573	15,352
Mississippi, Alabama, Florida	2,565	2,320	2,563
New Mexico	8,130	8,727	7,741
Texas	99,592	100,186	107,751
East Texas	7,571	8,056	8,515
West Texas	43,936	47,495	50,570
Texas Gulf	16,107	16,992	18,953
Other Texas	26,978	27,643	29,713
Wyoming	14,960	15,864	15,444
Other Rocky Mountain	9,450	9,364	10,212
California	26,863	26,625	31,149
Foreign	†14,471	14,815	14,380
Total	236,231	238,308	253,353

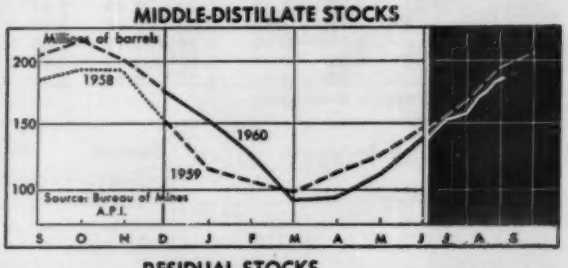
*Bureau of Mines. †Includes 4,094,000 bbl. in California.

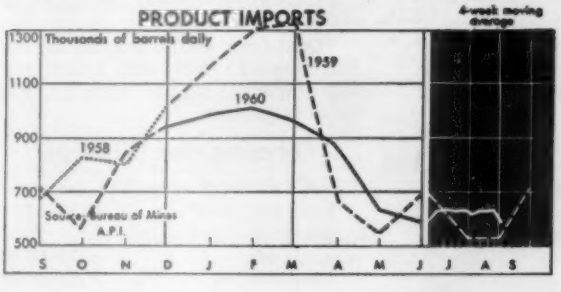


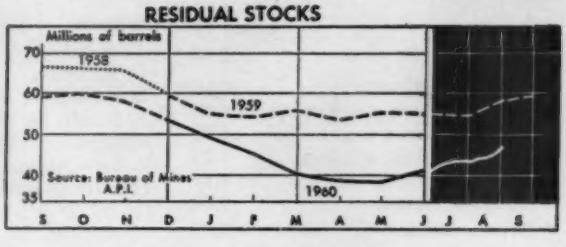












API REFINERY REPORT, SEPTEMBER 2, 1960

(Thousands of barrels)

District—	Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.	Stocks‡—Gaso.†	Kero.	Dist.	Resid.	Bureau of Mines, September 1959—Daily avg. runs	Daily average production—Gaso.*	Kero.	Dist.	Resid.
East Coast	1,143	546.1	24.7	341.0	127.1	44,402	12,937	56,844	13,015	1,065	520.0	30.8	321.1	151.0
Appalachian:														
District 1	100	39.9	4.7	20.3	6.1	5,745	753	3,624	451	97	41.8	2.6	21.4	6.2
District 2	108	56.7	5.1	20.0	11.1	3,045	496	1,739	309	96	52.9	5.6	16.8	6.2
Ind., Ill., Ky.	1,493	763.3	81.7	319.4	143.4	32,854	7,047	26,311	5,491	1,441	775.5	61.5	298.0	135.9
Minn., Wis., Dak.	131	57.8	7.3	36.0	17.1	6,322	1,586	7,433	589	104	49.6	4.6	27.0	11.0
Okla., Kans., Mo.	725	392.3	24.1	159.0	13.6	16,917	1,848	12,653	994	737	412.0	8.8	189.4	22.1
Inland Texas	304	241.0	9.3	42.7	16.7	6,886	631	1,412	2,517	276	217.7	7.1	47.9	21.0
Tex. Gulf Coast	1,955	965.3	115.5	470.3	150.1	24,478	3,348	15,975	5,659	1,795	911.7	86.9	420.1	138.8
La. Gulf Coast	698	374.4	65.4	159.0	42.3	9,857	2,414	7,292	1,472	706	377.7	61.1	147.8	49.2
N. La. and Ark.	110	55.0	7.3	21.4	7.6	5,648	876	2,433	136	73	33.5	3.1	13.9	5.4
Rocky Mtn.:														
New Mexico	25	12.6	0.3	4.6	4.3	629	56	176	7	23	12.1	0.2	4.4	2.1
Other	317	138.0	4.1	167.6	287.2	5,141	389	2,872	951	305	145.9	3.3	61.7	32.3
West Coast	1,185	529.0	36.4	167.6	287.2	26,741	1,503	14,259	15,706	1,160	521.8	1.2	175.7	271.5
Sept. 2, 1960	8,294	4,171.4	385.9	1,824.9	861.0	188,665	33,884	153,023	47,297	7,878	4,072.2	276.8	1,745.2	852.7
Aug. 26, 1960	8,172	4,212.4	392.3	1,819.0	893.1	190,680	32,327	148,966	45,309	.....	.....	.....	.....	.....
Sept. 4, 1959	8,132	4,207.1	276.0	1,810.4	910.4	181,509	31,354	163,198	57,507	.....	.....	.....	.....	.....

*At refineries including natural blended. †Finished and unfinished. ‡At refineries, bulk terminals, in transit, and in pipelines.

Crude-Oil Prices

GRAVITY SCHEDULE

	Signal Hill, Calif.	Oklahoma	West Tex. (sour)	West Tex. (Inter.)	No.* Texas	Texas Refugio Light	Bayou Sale (La.)	Denver Julesburg	Wyo. (sour)
14-14.9	$1.76	....	....	....	....	....	....	....	....
15-15.9	1.84	....	....	....	....	....	....	....	$1.81
16-16.9	1.92	....	....	....	....	....	....	....	1.86
17-17.9	2.00	....	....	....	....	....	....	....	1.91
18-18.9	2.08	....	....	....	....	....	....	....	1.96
19-19.9	2.16	....	....	....	....	....	....	....	2.01
20-20.9	2.24	$2.49	$2.35	$2.61	$2.29	$2.95	$2.90	$2.58	2.06
21-21.9	2.32	2.52	2.38	2.63	2.33	2.97	2.92	2.60	2.11
22-22.9	2.39	2.55	2.41	2.65	2.37	2.99	2.94	2.62	2.16
23-23.9	2.46	2.58	2.44	2.67	2.41	3.01	2.96	2.64	2.21
24-24.9	2.53	2.61	2.47	2.69	2.45	3.03	2.98	2.66	2.26
25-25.9	2.60	2.64	2.50	2.71	2.49	3.05	3.00	2.68	2.31
26-26.9	2.67	2.67	2.53	2.73	2.53	3.07	3.02	2.70	2.36
27-27.9	2.74	2.70	2.56	2.75	2.57	3.09	3.04	2.72	2.49
28-28.9	2.81	2.73	2.59	2.77	2.61	3.11	3.06	2.74	2.54
29-29.9	2.87	2.76	2.62	2.79	2.65	3.13	3.08	2.76	2.59
30-30.9	2.93	2.79	2.65	2.81	2.69	3.15	3.10	2.78	2.63
31-31.9	3.00	2.82	2.68	2.83	2.73	3.17	3.12	2.80	2.67
32-32.9	3.06	2.85	2.71	2.85	2.77	3.19	3.14	2.82	2.71
33-33.9	3.12	2.88	2.74	2.87	2.81	3.21	3.16	2.84	2.75
34-34.9	3.17	2.91	2.77	2.89	2.85	3.23	3.18	2.86	2.79
35-35.9	3.22	2.94	2.80	2.91	2.89	3.25	3.20	2.88	2.83
36-36.9	3.27	2.97	2.83	2.93	2.93	3.27	3.22	2.90	2.87
37-37.9	3.31	2.99	2.86	2.95	2.95	3.29	3.24	2.92	2.89
38-38.9	....	3.01	2.89	2.97	2.97	3.31	3.26	2.94	2.91
39-39.9	....	3.03	2.92	2.99	2.99	3.33	3.28	2.96	2.93
40-44.9	....	3.05	2.95	3.01	3.01	3.35	3.30	2.98	2.95

*Cooke, Grayson, Montague.

Flat Prices

Louisiana:
Sweet Lake $3.00

Texas:
East Texas 3.05-3.25
Conroe 3.23-3.53
Van 3.08

Pennsylvania Grade:
Bradford $4.75-4.80
Middle District 4.52
Southwest Pennsylvania 4.25
West Virginia 4.17
Buckeye Grade 4.08

★ **Illinois Basin** 3.00-3.05

Foreign

Middle East, Persian Gulf: (cargoes f.o.b. lifting port)
Arabian, 34.0-°-34.9, Ras Tanura $1.76-1.80
Iranian, 34.0°-34.9°, Bandar Mashur 1.74-1.78
Iranian, 34.0°-34.9°, Abadan 1.69-1.73
Iraq, 35.0°-35.9°, Fao 1.68-1.74
Kuwait, 31.0°-31.9°, Mina-al-Ahmadi ... 1.58-1.59
Qatar, 41.0°-41.9°, Umm Said 1.91-1.95

Middle East, E. Mediterranean:
Arabian, 34.0°-34.9°, Sidon $2.13-2.17
Iraq, Mosul-Kirkuk, 35.0°-35.9°, Tripoli . 2.15

Far East (cargoes, f.o.b. Lutong, Sarawak):
Seria Light, 37° 2.57

Canada:
Leduc-Woodbend $2.53
Redwater (Alta.) 2.42
Smiley (Sask.) 2.18
Pembina 2.38

Venezuela:
Cumarebo, 47°-47.9°, Tucupido 3.34
San Joaquin, 40°-40.9°, Puerto La Cruz 3.08
Oficina, 35°-35.9°, Puerto La Cruz 2.80
Tia Juana medium, 26°-26.9°, Amuay* 2.30
Quiriquire, 16.0°-16.4°, Caripito 2.10
Lagunillas heavy, flat, Las Piedras* 2.10
Bachaquero, flat, 15°-16°, Las Piedras* 1.88

Prices for all crudes of 24° or lighter vary 2 cents per degree change, up or down. All crudes heavier than 24° vary 2.5 cents per half-degree gravity change.

*Also available at La Salina at 3 cents per barrel less.

Tanker Rates (Long Ton)

(Latest reported spot fixtures)

Gulf-NY, dirty (ATRS—5%) . $2.71
Carib.-NY, dirty (ATRS—60%) 1.10
★ Carib.-UK, dirty (Scale—62.5%) (12s. 2d.) 1.71
★ PG-UK, dirty (Scale—57.5%) (26s. 7d.) 3.72

★Denotes change from previous week.

Refined-Product Prices

Following quotations are realistic spot prices for refined products moving interstate on Wednesday each week. They may differ from refiners' posted prices and should not be considered as postings.

Light-product prices are in cents per gallon. Residual and crude prices are dollars per barrel. Crude prices are at the well unless otherwise listed.

Gasoline*

Mid-Continent (Group 3):
Regular (91 octane).. 12.25-12.50
Premium (99 octane). 15.00-15.25
Natural gasoline (26-70) 4.5
Breckenridge 4.0

Gulf Coast (cargoes for coastwise or export movements):
Regular (90 octane) .. 11.00
Regular (92 octane) .. 11.25
Premium (98 octane).. 12.25

California (rack) Los Angeles:
Regular (88 octane) .. 11.65-12.15
Premium (94 octane). 12.65-13.15
Premium (100 octane) 14.00-14.65

Caribbean area (cargoes):
Regular (87 octane).. 10.125-10.25
Premium (97 octane).. 11.75

*Quotations are for octanes shown. Prices usually vary with octane ratings within the regular, premium, and aviation grades.

Kerosine and Distillate

Mid-Continent (Group 3):
Kerosine 42-44 ....10.125-10.375
Diesel oil (58 d.i. and above) 9.75-10.00
Distillate No. 1 ..... 9.75-10.00
Distillate No. 2 ..... 8.75-9.00

Gulf Coast (cargoes):
Kerosine 41-43 ..... 9.00-9.25
Distillate No. 2 ..... 8.25

New York Harbor (barges):
★ Kerosine 41-43 ..... 10.15
★ Distillate No. 2 ..... 9.15
★ Diesel fuel, 48-52 d.i. .. 9.45

Caribbean area (cargoes):
Distillate No. 2 ..... 8.125

Residual Fuel (Bbl.)

Mid-Continent (Group 3):
Residual fuel (max. 1% S) $1.90

Gulf Coast (cargoes):
Bunker C fuel 2.35

New York Harbor (barges):
Bunker C fuel 2.52

Caribbean (cargoes):
Bunker C $2.10

California (rack):
Bunker C fuel, Los Angeles $2.15

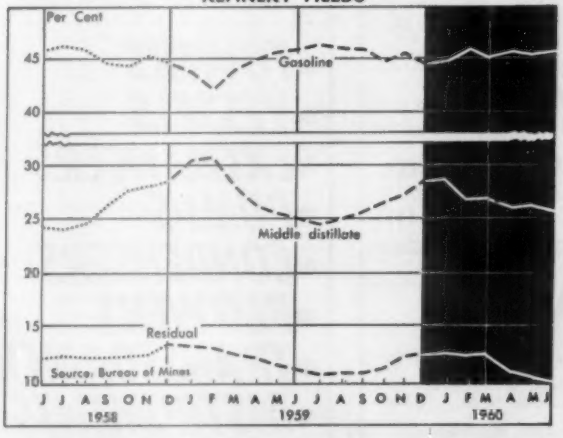
SUPPLY AND DEMAND—MAJOR PRODUCTS

(Thousands of barrels daily)

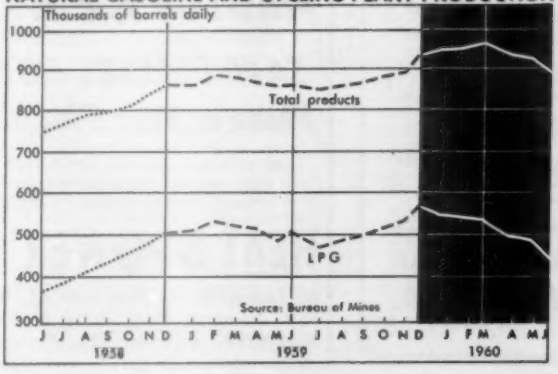
	Total demand	Refinery production	Stocks end of period†
GASOLINE			
August 1960*	4,430	4,215	189,000
July 1960*	4,575	4,235	193,400
June 1960	4,674	4,230	198,452
September 1959	4,401	4,111	174,128
August 1959	4,331	4,205	181,921
KEROSINE			
August 1960*	275	380	33,700
July 1960*	285	370	30,200
June 1960	223	325	27,354
September 1959	267	277	31,562
August 1959	143	234	31,221
DISTILLATE			
August 1960*	1,200	1,855	152,400
July 1960*	1,240	1,830	131,100
June 1960	1,364	1,778	109,174
September 1959	1,456	1,745	174,148
August 1959	1,069	1,804	164,134
RESIDUAL			
August 1960*	1,250	855	47,000
July 1960*	1,295	830	43,100
June 1960	1,377	843	41,074
September 1959	1,325	853	59,429
August 1959	1,170	884	57,855

*Preliminary. †Thousands of barrels.

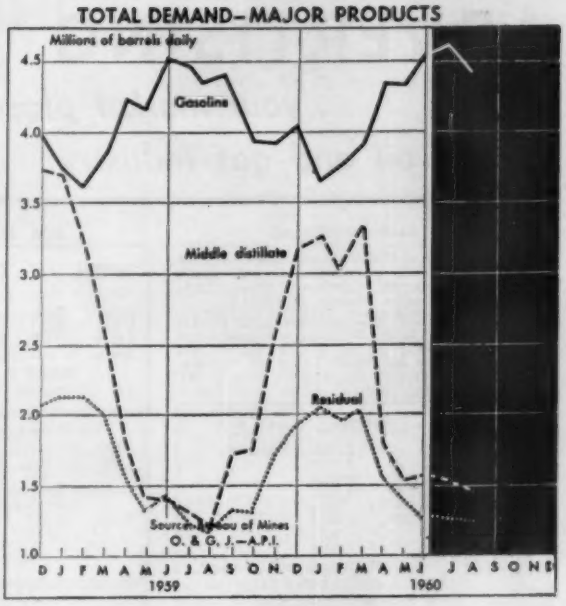
REFINERY YIELDS



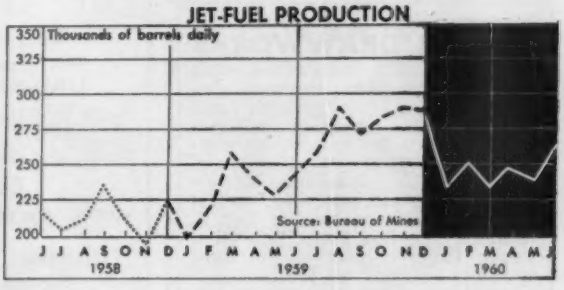
NATURAL-GASOLINE AND CYCLING-PLANT PRODUCTION



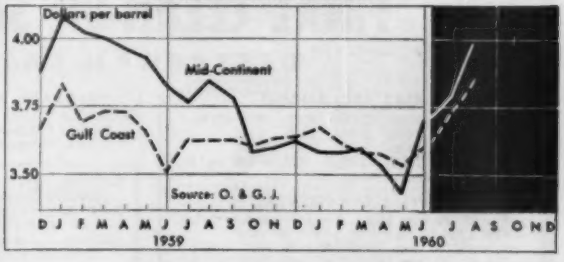
TOTAL DEMAND–MAJOR PRODUCTS



JET-FUEL PRODUCTION



REFINERY REALIZATION



REFINERY REALIZATION

	August*	July*	June	May
Mid-Continent	$3.99	$3.79	$3.70	$3.46
Gulf Coast	3.86	3.74	3.63	3.56

*Preliminary. Refinery realization is based on yields of major products and average spot prices of regular gasoline, kerosine, No. 2 fuel, and residual as published in The Oil and Gas Journal.

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VESSELS & TOWERS

8' x 73' 20 Tray 25#	4' x 36' packed 210#
7½' x 56' 20 Tray 35#	10' x 55' 60#
3' x 58' 30 Tray 154#	8' x 43' 60#
3' x 47' 20 Tray 120#	6' x 42' 200#
18" x 32' 15 Tray 130#	6' x 20' 40#
2' x 30' packed 50#	12' x 43' 25#

PUMPS

Hot Oil: 1"-6"; 50-400 gpm 100-3,000 ft. hd.
Boiler Feed: 190 gpm 1,500' hd.
Cooling Tower: 7,000 gpm 120' hd.
River Water Sump: 1,000 gpm 59' hd.

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15 Storage Tanks welded: 29,000, 10,000, 5,000, 3,750 barrel.
3 Spheres-Spheroids: 5,000, 10,000 barrel.

1—Carrier 853 ton refrigeration Compressor Turbine drive. (1953)
2—IR Turbo Exhausters 15,300 & 17,000 CFM 4.85 PSIG with Turbine Drives.
1—Clark Centrifugal Compressor 10,000 CFM—240 PSI discharge. (1953)

OTHER FEATURED ITEMS

1 Lummus: 35 mil. BTU furnace
2 Petro-Chem. Furnace: 1¼ mil. & 8 mil. BTU
2 B&W Boilers: 70,000# per hr.-450#
1 IR-XVG-4 Compressor
1 Worth LT-6 Compressor

WIRE!—PHONE! FOR COMPLETE INFORMATION

BRILL EQUIPMENT COMPANY—DESTREHAN, LA.—NORCO 6571
4101 San Jacinto St. Houston 4, Texas, JA 6-1351
35-65 Jabez St. Newark 5, N. J., MA 3-7420

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THE CITY OF CORPUS CHRISTI
CORPUS CHRISTI, TEXAS

Requests proposals to furnish full requirements of natural gas

The gas is to meet requirements for distribution to customers through the City of Corpus Christi's Gas Distribution System for a term of 20 years beginning on or about March 1, 1961. Inquiries should state any special conditions which a supplier must have included in any contract.

Estimates of annual requirements, load factor data, points of delivery and other pertinent data may be secured from:

G. C. Letch, Director of Public Utilities

302 South Shoreline

P. O. Box 111 **Corpus Christi, Texas**

LIQUIDATION AT ESSO STANDARD OIL REFINERY, BATON ROUGE

400 HP Compressors; Towers; Vessels; Heat Exchangers; Pumps.

For further information contact:

Chemical & Refinery Equipment Co.
Box 19351, Houston, Texas
Phone HO 8-1317

OR

Louisiana Steel Compress Co.
Box 588, Baton Rouge, La.
Phone DI 8-3371

TWO PERFORATING trucks with lines completely equipped with or without radioactivity logging equipment. These trucks are in excellent condition and ready for immediate use. Box L-897, The Oil and Gas Journal, Tulsa, Oklahoma.

REDA PUMP, 40% of new price, 60 H.P. motor just rebuilt, I47E pump, 86 stages, rated at 1885 B/D against 1670' head. For 6⅝" casing or larger. 3,000' of cable & all accessories. P. O. Box 407, Riverdale, Calif., TOwnsend 7-3504.

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TRAILER MOUNTED FRANKS "COMET 35" rotary drilling rig powered by GM 6-110 diesel. Excellent condition. Rig complete, less pump and drill string. Priced for immediate sale. Box L-978, The Oil and Gas Journal, Tulsa, Oklahoma.

OCS 40 H.P. POLLY UNIT

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In extra good condition. $3,500.

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1—4 x 6 Oil Well Pump	$500.00

PADRE DRILLING COMPANY, INC.
1109 Driscoll Building
Corpus Christi, Texas

EQUIPMENT WANTED

USED REFLECTION seismic instruments with magnetic tape, or used tape for installation with S.I.E. instruments. Please itemize pertinent data. Box L-972, The Oil and Gas Journal, Tulsa, Oklahoma.

WANTED HYDRAULIC Casing Pulling Machine. Send details. Luke Wise, Community Gas & Oil Co., Billings, Montana.

WE ARE interested in the purchase of your depleted wells for salvage. Also, used casing, tubing, units, tanks, etc. Must be in Kansas area. The Buckeye Supply Company of Kansas, Inc., 105 S. Main, El Dorado, Kansas.

HELP WANTED

PETROLEUM OR MECHANICAL engineer with experience in drilling and completing oil wells for selecting and abstracting literature and patents in these fields. Must have basic concepts of drilling and completion equipment and methods. Technical reading knowledge of either French, German, or Spanish required. N. Y. City. Box L-993, The Oil and Gas Journal, Tulsa, Oklahoma.

PETROLEUM ENGINEER, Chemical Engineer, or Chemist with laboratory and/or field experience in petroleum production and/or reservoir engineering to select and abstract articles and patents relating to oil production methods and equipment, oil recovery methods, and oil field corrosion problems. Technical reading knowledge of German and/or French required. N.Y. City. Box L-994, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOPHYSICIST: Abstracter of literature and patents in the fields of geophisics, physics, and electronics. Two or more years experience in petroleum exploration desirable. Technical reading knowledge of either French, German, Spanish or Russian required. Work includes selection of technical articles pertinent to geophysical oil exploration and abstracting such articles for world-wide distribution. N. Y. City. Box L-995, The Oil and Gas Journal, Tulsa, Oklahoma.

SENIOR PROCESS ENGINEER, degree in Chemical Engineering, with design experience plus minimum of 10 years in refinery or chemical plant operations. Outstanding opportunity in supervisory capacity for qualified man. Travel approximately 25% away from Home Office. Salary—about $12,000/year. Headquarters—West Coast. Box L-960, The Oil and Gas Journal, Tulsa, Oklahoma.

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All replies held in confidence.

Reply to: BOX L-976
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TULSA, OKLAHOMA

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EMPLOYMENT DEPARTMENT
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Houston 1, Texas
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West Coast Independent Oil Company has immediate need for qualified degree engineer with 10 to 20 years experience in engineering, construction and cost estimating. Duties involve the development and maintenance of cost standards; "flow-sheet" estimating for economic studies; estimating major construction projects; budget preparation and cost control. Minimum of 6 years experience in cost estimating for major contract work required.

Inquiries held confidential.

Forward resume,
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Box L-991
The Oil and Gas Journal
Tulsa, Oklahoma

BAKER & TAYLOR Drilling Co., needs derrickmen, motormen, rig helpers.; steady employment, paid vacations, Hospitalization & life insurance, safety program. Contact any Baker & Taylor toolpusher at, Spearman, Perryton or Canadian, Texas.

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SITUATIONS WANTED

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REFINERY SUPERINTENDENT with 30 years experience, would like to make connections with oil refinery needing help. Write: Box L-989, The Oil and Gas Journal, Tulsa, Oklahoma.

MECHANICAL ENGINEER BS—13 years experience, economics, design construction, operation products, crude oil, natural gas pipelines. 37 years old. Resume on request. Box L-990, The Oil and Gas Journal, Tulsa, Oklahoma.

GEOLOGIST, SEVENTEEN years varied major and independent experience, thirteen in West Texas-New Mexico. Good oil finding record. Desires retainer for generating and screening drilling deals. Box L-973, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION MANAGER, P. E. graduate, married. With majors, independents, and consulting for 14 years. Wide experience in well completions, workovers, reserve estimates, and property management. Would like position with responsibility and opportunity, or management contract properties. Dallas resident but willing to relocate. Box L-969, The Oil and Gas Journal, Tulsa, Oklahoma.

HELP WANTED

SITUATIONS WANTED

GEOLOGIST-EXECUTIVE — Management level of independent Co. in W. Va.-Ohio 13 years. Experienced in all phases; Business & Tax practices, production, drilling, leasing, gas repressuring, etc. age 42, married. Box L-981, The Oil and Gas Journal, Tulsa, Oklahoma.

PLANT SUPT.—Engineer: Desires employment with small oil company, independent operator or gas transmission company. 23 years experience in all phases of gasoline plant operation. Supervisor for over 19 years. Experience includes general plant engineering, plant design and layout, plant construction, plant maintenance, laboratory, gas and product sales. Presently employed. Experience with independent operator and major oil company. Box L-985, The Oil and Gas Journal, Tulsa, Oklahoma.

PRODUCTION SUPT. Petroleum Engr. Desires position either category. 17 years experience all phases drilling, producing operations both Major and Independents. Registered. Box L-941, The Oil and Gas Journal, Tulsa, Oklahoma.

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WEST TEXAS, Dallas area representatives calling on drilling contractors. Add fast selling tool-joint compound and rig cleaner through supply houses. P. O. Box 1057, Gardena, Calif.

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PROVEN PROSPECTS—Operator needs shallow prospects. Drilling budget up to $15,000 per well. Send information and geology to: Box L-986, The Oil and Gas Journal, Tulsa, Oklahoma.

FINANCIAL—Investment Banking Houses and Underwriters reached. Confidential. You can send the details of your proposition direct or thru your attorney to Consultant 817—51st Street, Brooklyn, N. Y.

I NEED A PARTNER. I have patent protection on a new and totally different drilling tool and process for the development of semi-depleted, tight, and shallow low gravity formations which do not respond to shooting, fracing, or flooding. Opportunities are unlimited in production development and rental tool business. I need a financially responsible partner or group willing to make an investment in this new tool and process and share proportionately in the profits. References exchanged. Box L-979, The Oil and Gas Journal, Tulsa, Oklahoma.

ESTABLISHED, responsible manufacturer with national sales and service organization wants products to be sold to oil, gas and allied supply industries. Equipped for manufacture, direct sales representation, distribution and warehousing. Proposals will be answered promptly. Box L-948, The Oil and Gas Journal, Tulsa, Oklahoma.

LEASE AND DRILLING BLOCKS

HAVE THOUSANDS of acres in West Virginia and Ohio, to farm out at once. David Law—Phone HU 5-6446, 716 Union Trust Building, Parkersburg, West Virginia.

FOR SALE—Working interest in 80 acres. Near production, quick payout. Well 750 ft. Eastern Kansas. Box L-970, The Oil and Gas Journal, Tulsa, Oklahoma.

PROVEN LOCATIONS to drill, market, substantial reserves. Box L-974, The Oil and Gas Journal, Tulsa, Oklahoma.

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FOR SALE—Oil production by owners. Illinois and Indiana. 145-A 5 Wells; 150-A 1 Well; 100-A 1 Well; 160-A 2 Wells. $6,000 to $65,000.00 Box L-992, The Oil and Gas Journal, Tulsa, Oklahoma.

⅛ WORKING INTEREST. Thurlow Field, Green County, Kentucky. 4 wells 1 year old. 55 acres room for 6 more. New drilling on adjoining leases. Present income $154.29 per month. Price $12,000. Reply, Box L-987, The Oil and Gas Journal, Tulsa, Oklahoma.

CAPITAL NEEDED to drill offset production in West Virginia and Ohio, If you have the dough, I have the know. David Law—Phone HU 5-6446, 716 Union Trust Building, Parkersburg, West Virginia.

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Box 1260
TULSA, OKLAHOMA

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LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 40 acres of land in one parcel, within the known geologic structure of the Harrisburg field, Banner County, Nebraska, are offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, October 26, 1960, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Adjudication Unit.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Santa Fe, New Mexico. Notice is hereby given that approximately 407.40 acres of land in 3 parcels within the known geologic structure of certain fields in Beaver and Kingfisher Counties, Oklahoma will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre at 2:00 p.m., MST, October 4, 1960, when bids will be opened. Details of the lease offering, how and where to submit bids, may be obtained from the Bureau's Land Office at Santa Fe, New Mexico. Douglas E. Henriques, Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Denver, Colorado. Notice is hereby given that 837.65 acres of land in six parcels within the known geologic structure of Bar-X Field, Mesa County, Colorado, will be offered for oil and gas leasing through competitive bidding to the qualified bidder of the highest cash amount per acre, at 2 p.m., M.S.T., October 26, 1960, when bids will be opened. Details of the lease offering, how and where to submit bids, and forms, may be obtained from the Bureau's Land Office, P. O. Box 1018, Denver, Colorado. Dale R. Andrus, Land Office Manager.

LEGAL

U. S. DEPARTMENT OF THE INTERIOR, Bureau of Land Management, Land Office, Cheyenne, Wyoming. Notice is hereby given that 320 acres of land in one parcel, within the known geologic structure of the Hugoton field, Morton County, Kansas, are offered for competitive oil and gas leasing through sealed bids to the qualified bidder of the highest cash amount per acre at 2:00 P.M., MST, October 19, 1960, when bids will be opened. Full details of the offering, and how and where to submit bids, may be obtained from the Land Office, Cheyenne, Wyoming. Arvin H. Olswold, Chief, Minerals Adjudication Unit.

ADVERTISERS in this issue

A

Alnor Instrument Co., Division of Illinois Testing Laboratories, Inc. 148
Aluminum Co. of America 24
Amercoat Corporation 52
American Meter Company 132
Appleton Electric Company 121
Autocar Division of The White Motor Company 20

B

Baash-Ross Division of Joy Manufacturing Company 21
Baker Oil Tools, Inc. 58
Ball Brothers Research Corp. 172
Baroid Division, National Lead Co. 131
Bethlehem Steel Company 38, 39
Black, Sivalls & Bryson, Inc. 42
Bovaird Supply Co., The 1
Braden Winch Company 174
BrakeSol, Inc. 47
British Petroleum Company Limited, The 126
Broderick & Bascom Rope Co. ..... Back Cover
Brodie Company, Ralph N. 26
Brown & Sharpe Mfg. Co. 32
Buell Engineering Co. 53

C

C-B Southern, Inc. 109
Cabot Shops, Inc. ..... Inside Back Cover
Cameron Iron Works, Inc. 31
Central Scientific Co. 140, 141
Chart-Pak, Inc. 149
Chiksan Company 23
Classified Advertising 190, 191, 192
Columbia-Southern Chemical Corporation, Subsidiary of Pittsburgh Plate Glass Company 54, 55
Continental-Emsco Company, a Division of the Youngstown Sheet and Tube Company 115
Coors Porcelain Company 183
Crose Perrault Equipment Corp. 113

D

Darling Valve and Mfg. Co. 51
Delta Air Lines 148
Dover Corporation—The W. C. Norris Manufacturer Division 142, 173
Dowell 60, 61, 156
Drilling Equipment Manufacturing Co. 171

F

Fairbanks, Morse—Electrical Division 143
Federal-Mogul Service Division of Federal-Mogul-Bower Bearings, Inc. 15
Fiese & Firstenberger Mfg., Inc. 50
First City National Bank of Houston 92
Fischer & Porter Co. 44, 45
Fisher Governor Company 37
Ford Motor Company 56
Foreman Pipeline Industries 147
Fort Worth National Bank, The 112
Fuller Company 12

G

Goodall Rubber Company 138
Goodrich Chemical Company, B. F. (Hycar) 5
Grove Valve and Regulator Company 40
Guiberson Corporation 18

H

Halliburton Company ..... Inside Front Cover, 8, 9, 175
Henson, Kenneth W. 147
Homco 134, 135
Hudson Engineering Corporation 125
Huey & Co., S. E. 147
Hughes Tool Co. 90, 91

I

International Nickel Company, Inc., The 62

J

Johns-Manville Corporation 50
Johnston Testers, Inc. 170
Jones & Laughlin Supply Division 160, 161
Jones Company, The S. M. 158

K

Koppers Company, Inc. 149, 153

L

L-K Pump Valve Company 141
Larkin Packer Company, Inc. 2
Layne & Bowler, Inc. 79
Liberty Manufacturing Company of Texas 7
Lone Star Steel Company 110, 111

M

Macco Oil Tool Company, Inc. 145
Magnet Cove Barium Corp. 10
Martin-Decker Corp. 140
Martin, Manufacturer, John N. 157
Mayo Hotel, The 173
Mercantile National Bank 47
Mid-Continent Supply Company 167
Milwhite Mud Sales Company 22
Minneapolis-Honeywell Regulator Co., Industrial Division 154
Mission Mfg. Company 75

N

National Bank of Commerce, The 178
National Tank Company 194
National Tube Division 34, 35
Norris, Manufacturer, W. C., Division of Dover Corporation 142, 173

O

Oil and Gas Journal, The 117
Oil Well Supply Division 4
Olin Mathieson Chemical Corporation, Chemicals Division 3
Otis Engineering Corporation 49

P

Parker Seal Company 146
Parkersburg Rig & Reel Co. 6
Petroleum Distributing Company 157
Pipe Linings Inc. 46

R

Reda Pump Company 132
Refinery Supply Co., The 140, 141
Republic Rubber Division of Lee Rubber & Tire Corp. 147
Robbins Aviation, Inc. 155
Rockwell Manufacturing Company 14
Roebling's Sons, John A.—Division of The Colorado Fuel and Iron Corporation 30
Rust-Oleum Corporation 25

S

Schlumberger Well Surveying Corp. 177
Scott-Rice Company 173
Sinclair Oil Corporation 76
Southwest Industries, Inc. 83
Standard Oil Company of Indiana 28
Stewart & Stevenson Services, Inc. 89

T

Teletype Corporation, Subsidiary of Western Electric Company, Inc. 144
Tennessee Gas Transmission Company 48
Texas Employers Insurance Association 11
Thompson Pump Company 47
Thornhill-Craver Co. 13
Timken Roller Bearing Company—Steel and Tube Division 29
Tretolite Company, A Division of Petrolite Corporation 150

U

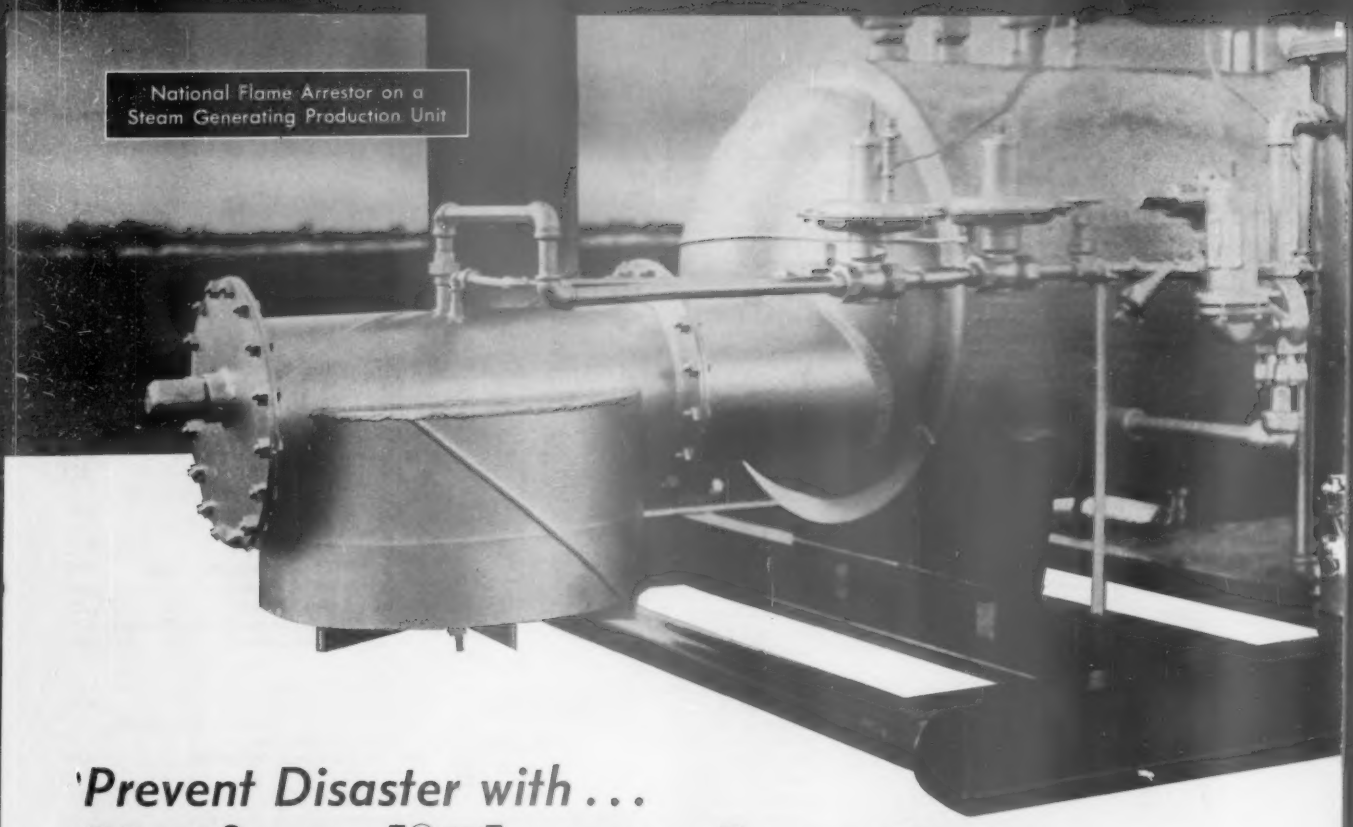
Union Carbide Chemicals Company, Division of Union Carbide Corporation 27
United States Steel Corporation—National Tube Division 34, 35
Oil Well Supply Division 4

V

Visco Products Co., Inc. 19

W

Wall Colmonoy Corporation 153
Warner Lewis Company 123
Waukesha Motor Company 33
Well Equipment Mfg. Corp. 151
Well Reconnaissance Inc. 172
Westinghouse Electric Corporation 16, 17
White Motor Company, The 20
Williamson, Inc., T. D. 41
Worthington Corporation 141
Wyandotte Chemicals—Michigan Alkali Division 36



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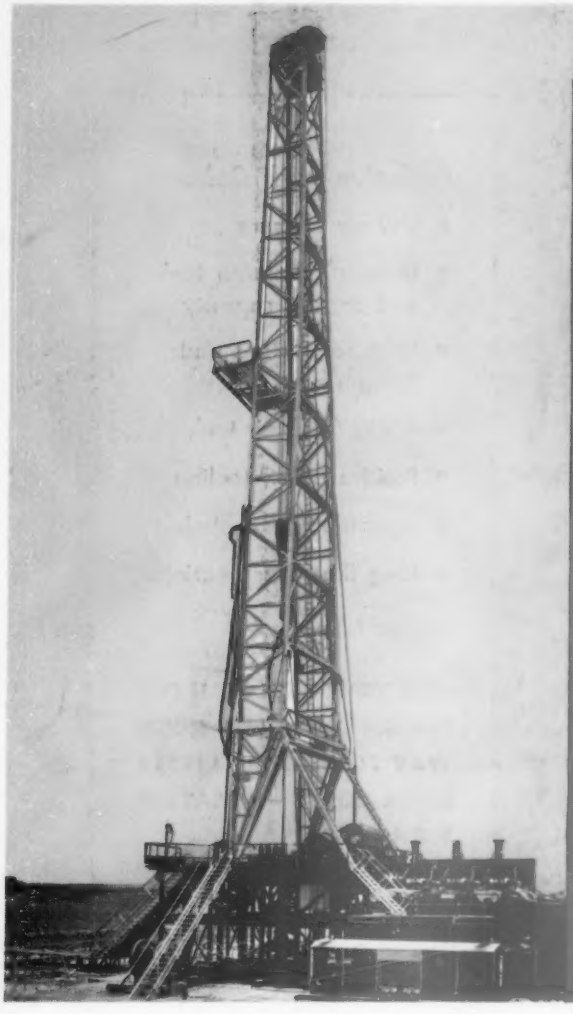

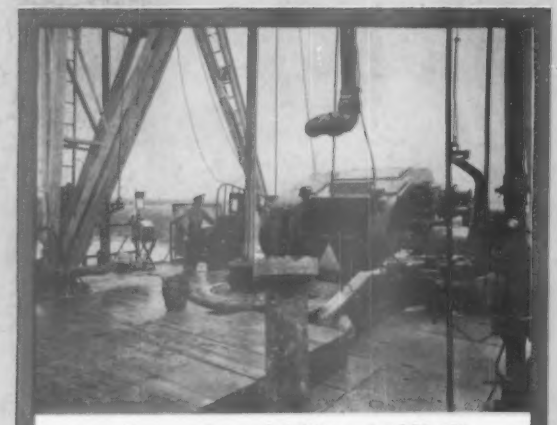

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